AUTOMOTIVE and Aviation INDUSTRIES

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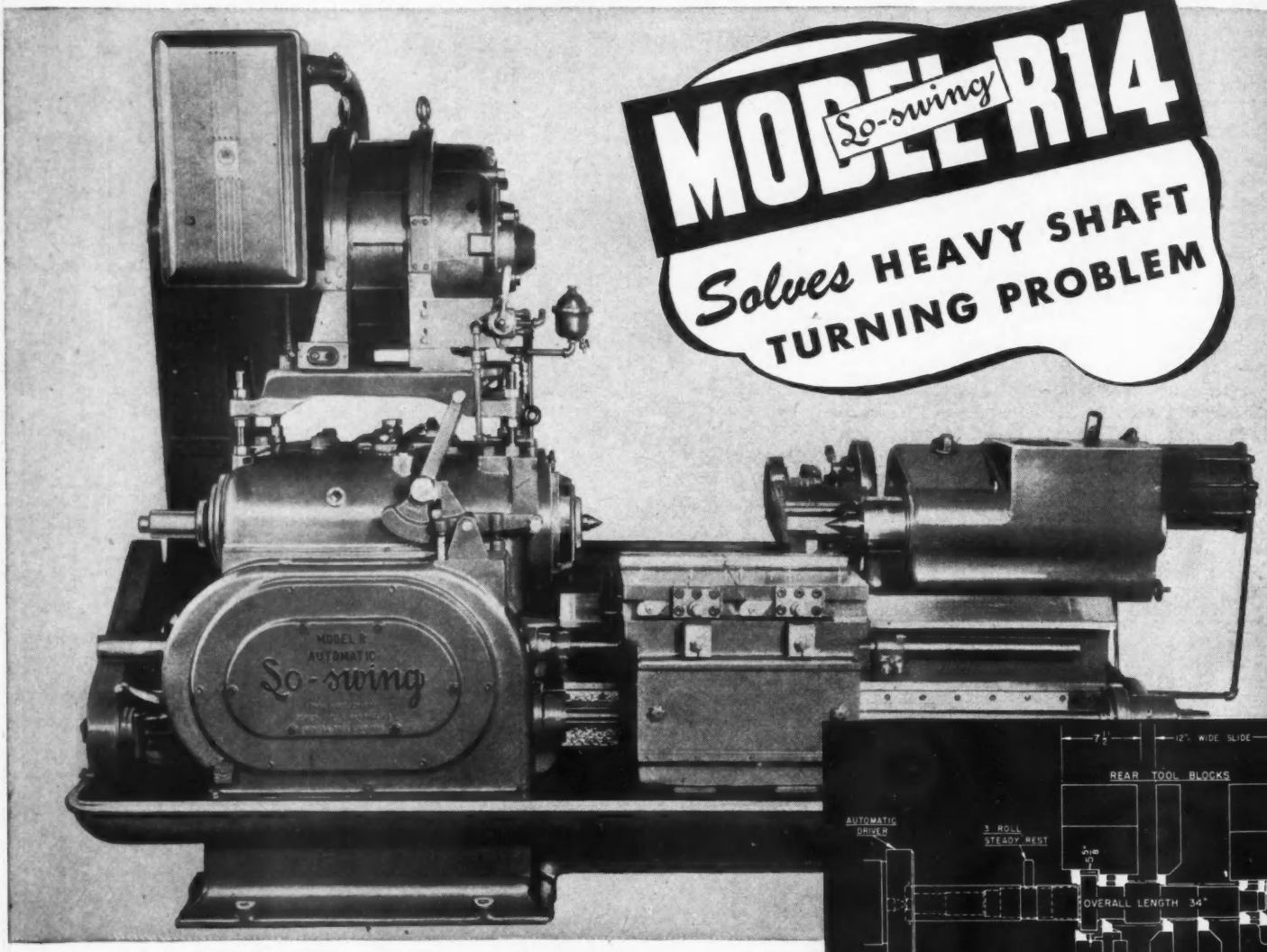
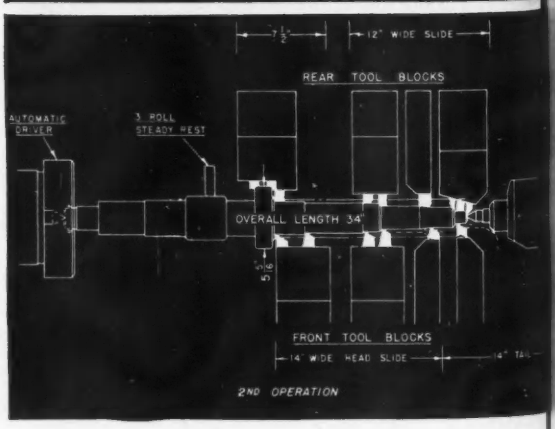
MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK

MODEL R14 Lo-swing

Solves HEAVY SHAFT TURNING PROBLEM





Problem: **To provide a single Automatic Lathe capable of turning, facing and undercutting a variety of heavy forged shafts and requiring minimum time for change-over from job to job.**

Solution: **The Model R-14 Automatic Lo-swing Lathe was chosen for this job, primarily because it had the power and capacity necessary to handle heavy shafts from 3" to approximately 8" diameter. The built-in, Quick Change-over Mechanism on this Lathe also provided a simple and speedy means for varying the carriage stroke, as required for each individual shaft.**

The forged shafts come to the Lathe centered on both ends and spotted for the three roll steady rest (first operation only). One end of the shaft is first turned and faced, then reversed (second operation) and the other end turned and faced as shown in the line drawings. The shaft is driven with a Standard Seneca Falls Automatic Work Driver which prevents slippage of the piece, thus taking full advantage of cemented carbide tools with high cutting speeds and coarse feeds.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

LATHE NEWS from SENECA FALLS

AUTOMOTIVE and AVIATION INDUSTRIES

Published on the first and 15th of the month

Volume 95, No. 7
October 1, 1946

Must We Have Strikes?

By Larry S. Davidow
Former General Counsel, International Union, U.A.W.A.

STRIKES as a means of industrial warfare have been accepted by many people. The upsurge of union organization, in a large measure inspired by the New Deal administration, has contributed greatly to popularizing their use in industrial disputes. So promiscuous and hasty has become this use that it seems that the accepted technique now is to strike first and bargain afterward, no matter how unjustified the stoppage or how willing the employer may be to discuss the grievance and come to an agreement over real or even fancied grievances.

The enormous industrialization which has marked the development of the United States since the beginning of the century, particularly the terrific impetus given to industrial growth by the first and second world wars, has brought about a complete interdependence of industry and the economic life of the nation. Strikes involving even relatively unimportant, small or inconspicuous concerns can very well bring about a paralysis of a gigantic nature in a large segment of an industry or even the entire nation.

Jungle warfare tactics that were tolerable in the early days of industrialism, become impossible in the era of a highly integrated and closely dependent society where any pebble thrown into the stream of our economy can create a backwash capable of bringing about a tidal wave catastrophe.

There has developed a certain peculiar concept about labor organizations, viz., "Labor can do no wrong." Again, this, in large measure, has been promoted by the New Deal administration. Organized labor has been given a special and privileged place in our country. Not only has it been encouraged to grow, with the law being deliberately tipped in its favor, thereby creating injustices toward management and industry, but there has also been evolved such a sacrosanct concept of organized labor as to raise it almost to the position of a deity. The spokesmen of organized labor insist that any effort to apply to it rules and regulations enforced upon other segments of our population in order to prevent abuses, must not be attempted.

Any effort to urge or promote such regulatory action opens one to the charge of being a labor-baiter and trying to destroy organized labor. Obviously such a concept is sheer nonsense. However, if it merely stayed in the realm of nonsense, it would not mean so much. The tragedy of it is that this nonsensical attitude is working for the complete breakdown of our economy, and ultimately in national disaster.

Can the unbridled appetites for more power of the leaders of organized labor, and the inevitable abuses that come from uncontrolled power, be permitted to go on unchallenged? Are we to sit supinely by and watch this irresponsible and uncontrolled action go on without restraint even though the life of the entire nation be jeopardized, if not ultimately destroyed?

(*Turn to page* 78, *please*)

Why GM Production Is Only Half of '41 Rate

By C. E. Wilson
President
General Motors Corp.

IF ANYONE had said to me a year ago that in one full year from then General Motors could have only achieved a production at about half the rate achieved in '41, I would have laughed at him. Nevertheless, that is where we are. The problems are in getting the flow of materials and parts through our plants and also the problems of worker efficiency and efficient organization. National strikes are like a war—the duration is longer than the war. A three or four months' strike takes out six or eight months' production because it has a disorganizing effect that cannot be recovered until the strike is over.

Worker productivity varies a good bit in different plants, depending on the number of new people or inexperienced people involved, and the flow of materials. It looks as if under present circumstances, the present production efficiency averages about 80 per cent of the prewar standard. Naturally, we hope to do much better than that. There is no good reason why, with the 40 hour work week, and the reasonable percentage of able-bodied folks, that it shouldn't be at least prewar standard. We have a very high turnover of labor in our plants now. We are trying to find out why. There are all kinds of reasons. Apparently the people in the whole country are restless. We have a good deal of absenteeism, perhaps three times the normal prewar figure. In other words, where perhaps during prewar in all our plants there would be 5000 people absent in a day, now there are 15,000. When those 15,000 people don't turn up you have to rearrange the work. That always causes some loss of production. I don't know why it is but a good many people just don't seem to be too much interested in work. I think it is a restlessness, as an aftermath of the war. The only thing that will straighten the thing out is a lot of efficient production. That is the only way that wages and prices can be balanced and people satisfied.

Raw material up to right now has not been the problem. Potentially it can be, in the months immediately ahead. There are apparent shortages in basic raw materials. Lead is one of the most serious ones. As a matter of fact, some time ago we had a serious discussion on whether we were willing to ship cars without storage batteries for our September productions. We found enough to go through September, but October is in question. That is tied up with past strikes in lead mining and refineries, and also tied up with the price. Lead available in this country comes from three sources—domestic mining and smelting, reclaimed lead from all storage batteries, and other sources, and imports. We imported lead from Mexico, Canada, and perhaps Australia. No citizen has a right now to import anything. It is all under Government regulations. The world price of lead is nine cents and the domestic is eight and a quarter cents. There is also a duty on imported lead, so that the difference between the world price and the American price is very considerable. While OPA regulations were off the dealers in lead scrap collected quite a lot of lead scrap, which they are reluctant to sell at the present time. Also it is clear from the statistics that the total production of lead in this country is not equal to the requirements. I have been told from what I believe is a reliable source that our State Department or some branch of Government has committed them and we wouldn't import any lead

(*Turn to page* 67, *please*)

This article consists of excerpted statements from the transcript of the press conference held Sept. 4 by Mr. Wilson at Detroit.

Advanced T

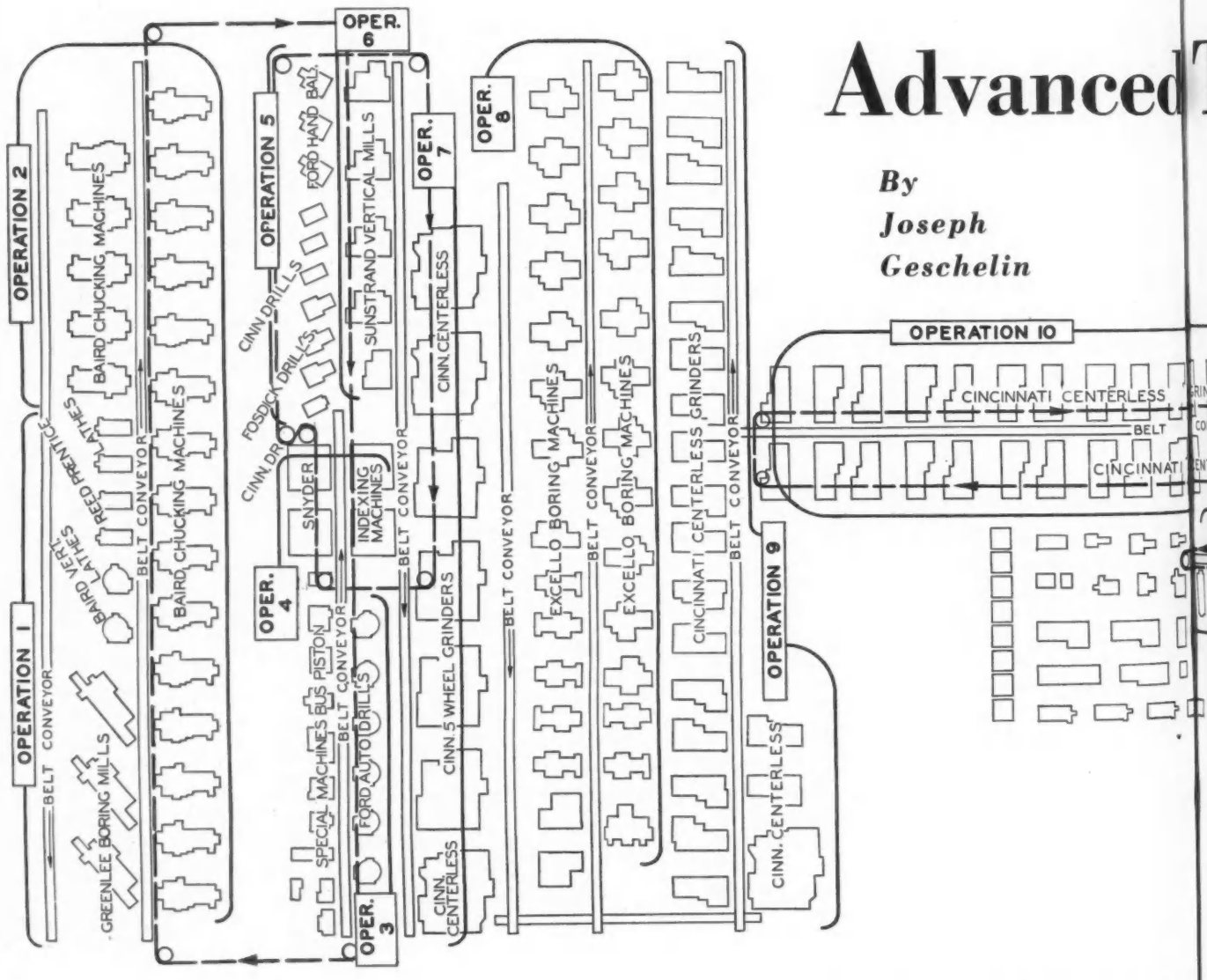
By Joseph Geschelin

HAVING completed the grind of an unceasing schedule of war production, the famous motor building of the Ford Motor Co. is now in the process of receiving the finishing touches of a postwar program of modernization coupled with the introduction of advanced production methods. Since the process of conversion to the new plan has not yet been completed, the object of this study is to touch briefly on a sampling of what has been accomplished in two departments —crankshaft and piston.

Events of the past months have simplified the program materially. For one thing, the motor building now is geared to the production of just two engines—the V-8 and the Six. That made it possible to align both the crankshaft and piston lines for just two parts, making it convenient to run them through the same department but over independent lines of metal cutting equipment.

Possibly the most radical change has been made in the piston department with the rearrangement to handle aluminum pistons only for the V-8 and the Six. The major contribution to increased productivity per worker and a consequent lowering of prime cost is found in the development of a unique materials handling system in which a linkage of 16-in. belt conveyors reduces manual handling of the work and permits of an approach to almost complete automaticity of some operations.

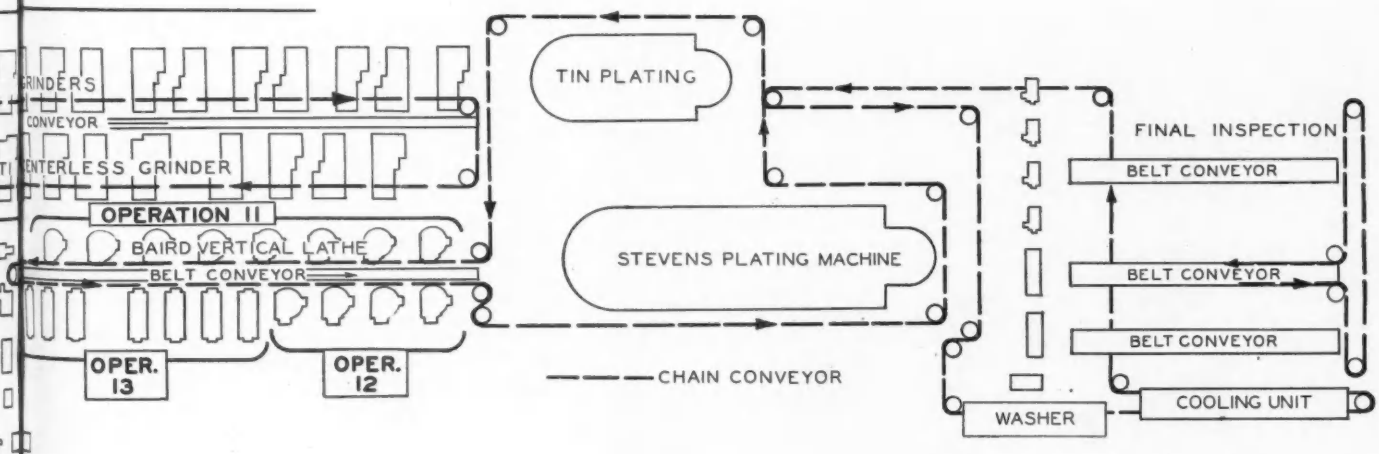
It may be noted at this point that management philosophy at Ford places a premium on easing the physical burden of the workers. In its final expression this ideal places the entire burden of individual operations on the machine and on the materials handling system—in its various forms—thus relieving the worker of manual tasks and giving him the role of machine tender. For example, the piston department as it was before the present changeover employed a monorail conveyor for linking the various operations. In this department the placing of pistons on the conveyor hook along the line of automatic



This is one of a battery of new deep hole drilling machines with sensitive step-by-step drilling of crankshaft oil holes. The tooling and fixtures were supplied by H. R. Kreuger.

This is the 122nd in the series of monthly production features

Tooling at Piston and Crankshaft Departments Reorganized by Ford



Layout of Piston Dept. No. 435 at Motor Bldg. of Ford Rouge plant.

This is the right hand side of the line of No. 5 Cincinnati Centerless Grinders, showing ground pistons being unloaded from the machine and directed onto the belt conveyor. From this point on the work is transported to the adjacent line of Ex-Cell-O precision boring machines for boring the wrist pin holes.

turning machines imposed a heavy burden considering that the act of picking up a piston, raising a man's arm to the conveyor level, returning the arm to the work station, and doing this many times each minute induced considerable fatigue.

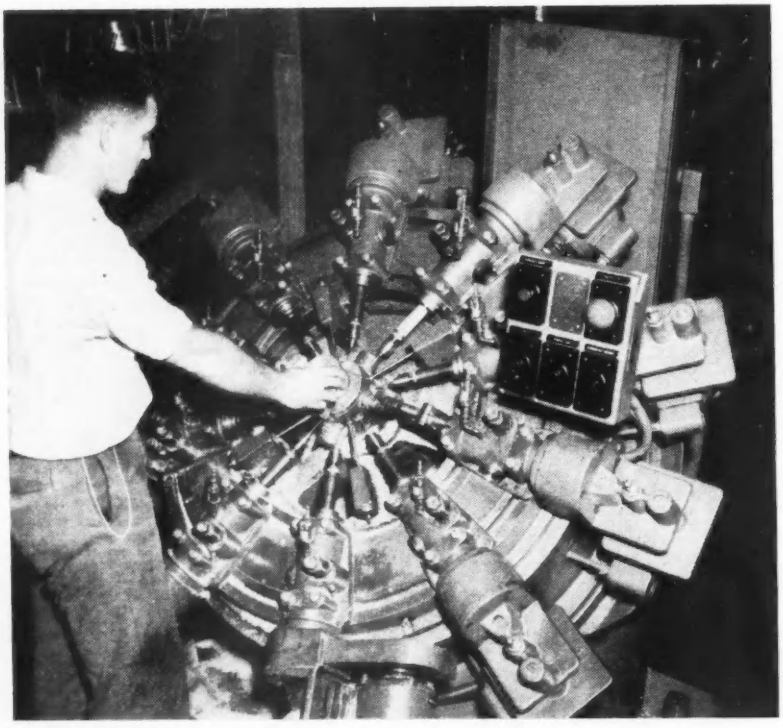
In the present arrangement of belt conveyors, the work comes out of the machine automatically, rolls onto the belt and moves to the next operation without manual effort.

The general arrangement of the self-contained piston department can be visualized from the floor plan reproduced here. The major steps in metal removal are concentrated in the rectangular area at the left, linked completely by the belt conveyor. The lateral area at the right—forming the leg of the T—includes Cincinnati Centerless cam grinders, other equipment for detail operations, the Stevens automatic tin-plating equipment, and final inspection.

Let us consider the major operations in the machine shop at the left. The first group of machines—the two lines at the extreme left—takes care of the main roughing operations, includes Greenlee automatic chucking machines, Baird four-spindle vertical lathes, and Baird six-spindle automatics. This line removes perhaps as much as 60 per cent of the metal. Some of the machines are permanently tooled for six-cylinder pistons, others are tooled for V-8 pistons. To simplify the traffic problem the larger pistons always move along the outer edge of the belt while the smaller ones move on the inside edge.

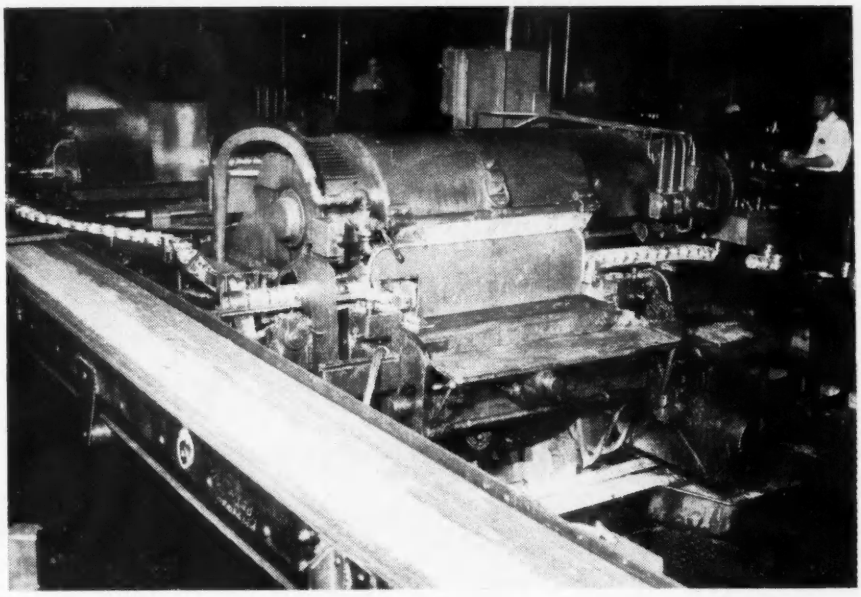
Wherever feasible, the machines are fitted with magazine feed and automatic ejection so that work can be fed into magazines either by hand or automatically from the conveyor belt, then ejected directly onto the belt. This objective is facilitated by the application of divider or deflector strips attached to the frame of the conveyor and so inclined as to provide a positive path from the belt to the machine or operator.

Perhaps the best example of the potentialities of this principle is found in the OD rough-grind line of No. 5 Cincinnati Centerless grinders — the group of seven machines in the fifth line from the extreme left. Incidentally, these grinders are quite interesting in themselves since they have five grinding wheels in line on the spindle, remove metal from the OD in five progressive cuts, thus reducing the heat developed



Closeup of one of three new Kreuger piston drilling machines described in the text. Note the inclination of the work table to facilitate loading and unloading of the fixture.

Here is a closeup of one of the battery of No. 5 Cincinnati Centerless Grinders in the rough grinding line. As mentioned in the text, the pistons are directed automatically into each machine off the belt on the left by a guide and chute. Then they are fed into the machine by the loading mechanism.



in grinding and thereby holding size and form to desired limits.

It will be noted that the line has conveyor belts on both sides. The belt on the left feeds pistons from the preceding operation into the magazine of the grinder, the work being deflected into each machine from the belt and fed by an automatic loading device. After the pistons have completed the cycle within the grinder they are automatically unloaded and directed onto the belt at the right through a connecting chute. This belt transports the work to the line of Ex-Cell-O precision boring machines for boring the wrist pin hole.

Considering this cycle of events, it is obvious that the Cincinnati line is completely automatic as to loading, machine cycle, unloading, and transport to the next operation. The fact of the matter is that only one machine tender is required to cover the entire battery of grinders.

The development of the belt system within the limited space allowed for this department posed quite a sizable task and required skillful planning. To show how this was finally worked, we refer you to the drawing, reproduced here, of the plan and elevation of the belts and drive mechanism at the junction of the three belt lines in the foreground.

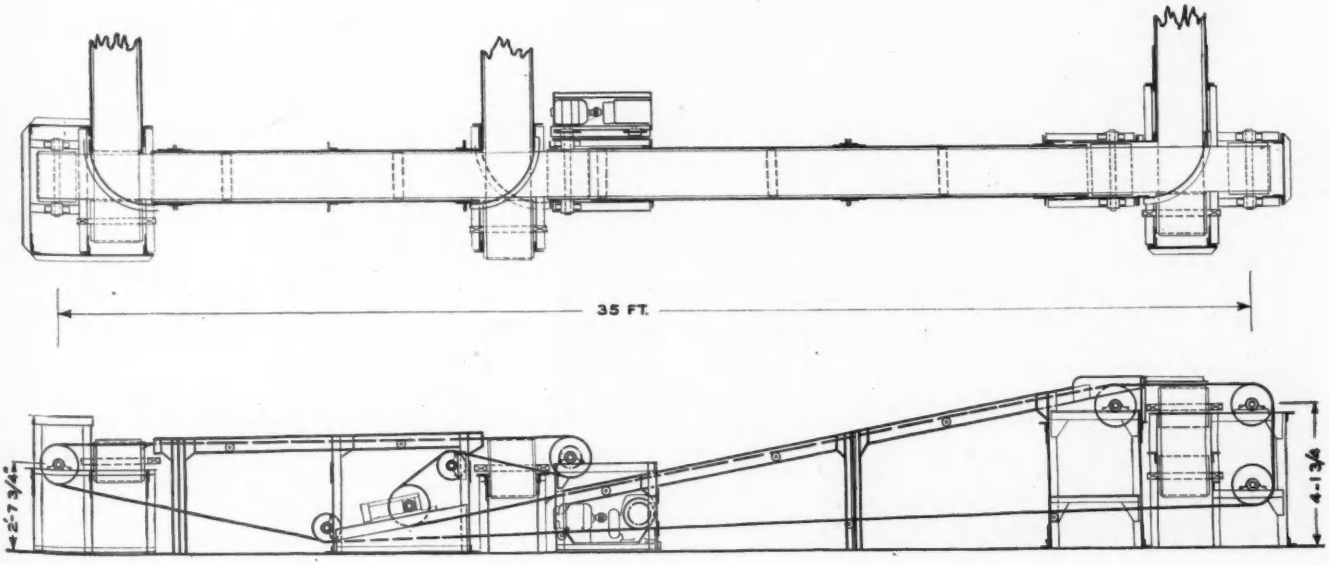
To supplement the outline given above, we have reproduced the following routing showing the sequence of operations in the production of the Six piston This is self explanatory and permits the reader to visualize the operations from start to finish.

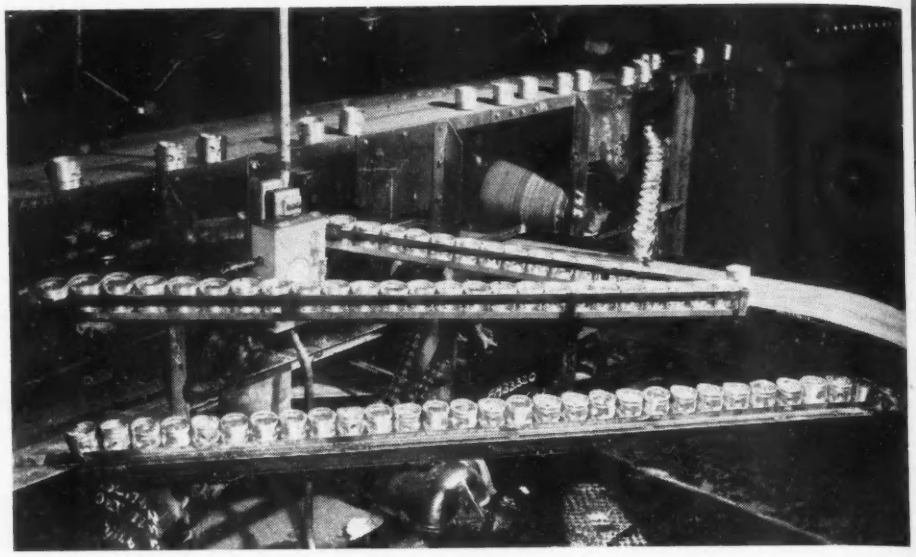
OPERATION AND EQUIPMENT

Counterbore and face skirt—**Greenlee Automatic Chucking Machine.**
Turn OD and dome—rough and finish ring grooves—**6-spindle Baird Machine.**
Drill (10) holes 3rd groove (A2 piston only)—**Special 10-Spindle Drilling Machine.**
Drill (2) ¼ in. holes—**Snyder Rotary Machine.**
Mill vertical slot in skirt, balance for weight—**21 in. Fosdick Drill.**
Saw (2) horizontal slots—**Sundstrand Vertical Mill.**
Rough grind OD (3.302)—**Cincinnati Centerless Grinder.**
Bore wrist pin hole—**Ex-Cell-O Precision Boring Machine.**
Semi-finish ring lands 3.280-3.282, cam grind OD, cam grind OD cam 3.2975—**No. 2 Cincinnati Centerless Cam Grinder.**
Cut wire retainer groove, burr and clean ring grooves—**4-Spindle Vertical Baird.**
Tin plate—**Stevens Plating Machine.**
Inspect—**Bench.**

With the use of aluminum, exclusively, in this de-

Elevation and plan views of belt conveyor (16 in. wide) for handling aluminum pistons.





This is an interesting view of the belt conveyor at the extreme right hand of the floor plan. Here are four lines of pistons converging to a single belt for transport to the line of Cincinnati Centerless Cam-Grinders.

partment all of the cutting tools are tipped with cemented-carbide.

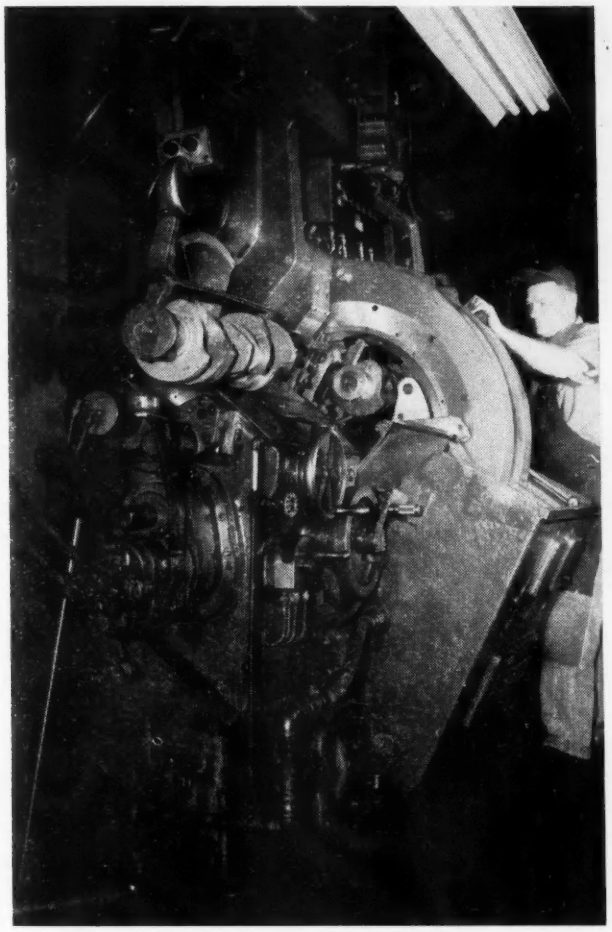
Besides the conveyorization described above, the department has undergone other changes. For one thing, the rough turning line at the left is traversed by a trench in the floor to carry away all chips and turnings. Chips are ejected from each machine into an opening in the trench and drop into a moving bucket conveyor. This load of chips is moved continuously to a gallery at an adjacent outer wall where the scrap is blown directly into box cars for removal.

Another interesting development is the introduction of a central filtering and clarification system for the cutting fluid used in all machines in this department. The fluid flows in a trench into two pits or still tanks where the metallic particles are trapped. The fluid is pumped continuously into the three clarifiers and is then recirculated through the machines. Unusual feature of the system is the installation of the tubular type rubber block chip conveyor introduced recently by Hapman. The large tube containing the closed conveyor is made of stainless steel to resist corrosion and is bent so as to receive fine grindings at the extreme sump of the pits. These are picked up continuously and discharged into receptacles on the floor.

The next stages of advanced machining practice in this department are being introduced gradually on an experimental basis. Ultimately, the new equipment now under test should mark the most advanced practice known to the art. One example of this is a six-spindle Baird chucking machine now in operation, which has a double-index cycle and is expected to produce double the output of the single-index, six-spindle machines which have been the standard at Ford for many years. While the single machine is being studied an effort will be made to develop a means of automatic loading by magazine and automatic unloading onto the belt.

The other example of advanced practice is a single-spindle Ex-Cell-O precision boring machine, the forerunner of equipment designed to replace the six-spindle Ex-Cell-O boring machines now in use. This machine is equipped with an automatic cycle, a magazine feed, and automatic ejection of work from the machine onto the belt conveyor. In this instance, the elimination of manual handling through automaticity is expected to produce greater output from the single-spindle machine than Ford now gets out of the six-spindle machine. Moreover, one operator will be able to handle a number of these fast automatic machines. If this machine

Shown here is the work station of one of the big, rugged Landis automatic crankshaft grinders in the crankshaft department. This one — a 5-wheel machine — grinds the main line of the Ford six-cylinder engine crankshaft. A similar machine is set up for the same operation on crankshafts for the V-8 engine.



View of the new LeBlond center drive crankshaft lathe which performs six operations on the crankshaft main line. The loading conveyor station mentioned in the text may be seen at the left. The mechanical unloading conveyor is at the right. It is understood that 20 of these machines will be installed in this department.

proves to be all they expect, the next step will be the development of a two-spindle machine with the same type of automatic cycle.

Still another improvement is found in the technique of drilling piston oil holes. To this end Ford has installed several new 10-spindle drilling machines built by H. R. Kreuger Co., and designed with a continuous automatic cycle of operation. In its present form, as illustrated, an operator drops a piston into the fixture in the center, the drills then approach the work and drill the holes in one pass. On the return of the drills the operator picks the finished piston out of the fixture with his right hand and inserts the next one.

As shown, the machine bed is inclined at 45 deg to facilitate loading. The drill heads are adjustable for any position and can be rearranged in the event of a change in piston design. At the present writing, with hand loading, the machine is capable of producing 700 pistons per hour.

As is the case of the several other experimental machines installed in this department, plans are under way to develop an attachment for automatically loading the pistons into the fixture directly from the belt conveyor; and an automatic unloader which will eject work from the fixture and push it onto the belt conveyor for delivery to the next operation.

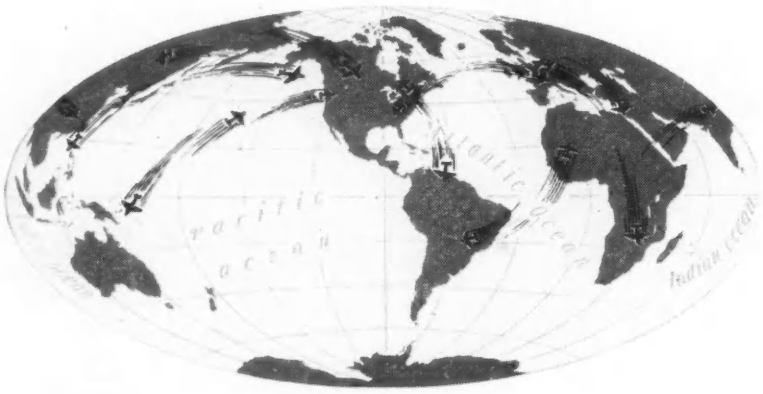
The crankshaft department also has profited by concentration on improved methods and shorter lines of material flow. The new set-up differs from the arrangement during the war in several ways. For one thing, there are only two crankshafts going through the department—the V-8 and the Six. Consequently, the machinery has been shifted about so as to make, in effect, two separate machine lines—one for each type of crankshaft insofar as possible. This change alone has been responsible for speeding productivity.

Even more important, in the opinion of the plant superintendent, is the introduction of the new LeBlond center drive crankshaft lathe which rough- and finish-turns the entire main bearing line in one setting. Besides being fully automatic in operation, this machine has a unique feature—a built-in rail-mounted conveyor on each side of the work station. The feeder on the left of the machine carries the crankshaft into the work station and lowers it

(*Turn to page* 82, *please*)

Another view of the belt conveyor. Pistons travelling on the upper level are moving from the rough grinding section to wrist pin boring. The lower level belt carries them from the Ex-Cell-O boring line to the line of No. 2 Cincinnati Centerless grinders for grinding of ring lands.

Proposed PICAO A



Design Standards for Aircraft Structures

UNLESS otherwise stated, all structural requirements shall be complied with: (a) at all weights from the design minimum weight to the design maximum weight; the design maximum weight shall be not less than the design take-off weight; (b) when the center of gravity of the airplane is in the most adverse positions compatible with the weight assumed, within the range for which certification is desired; (c) when the weight is distributed in the most adverse manner, within the operating limitations for which certification is desired.

The following weights shall be used to show compliance with the structural requirements: gasoline 6.0 lb per gal; lubricating oil 7.5 lb per gal; crew and passengers 170 lb per person. True weights may be used when establishing the current operating weight of the airplane.

Strength Requirements—General

Strength requirements are, as far as possible, specified in terms of flight and ground maneuvers, and of atmospheric gusts. The external loads arising in such conditions shall be placed in equilibrium with appropriate inertia loads. The specified loads, except where otherwise stated, are limit loads. The ultimate load is obtained by multiplying the limit load by a factor of safety. The factor of safety applies to the external and inertia loads and not the internal stresses arising from these. In normal circumstances, the factor of safety shall be 1.5. When there is uncertainty about the strength of parts of the structure (for example, fittings and castings), these parts shall be designed with such factors as will reasonably be expected to bring their standard of reliability up to that of the rest of the structure.

STRENGTH AND DEFORMATION—It is required that for all critical loading conditions: (a) the primary structure as a whole shall be capable of supporting the ultimate load; (b) at any load not exceeding the limit load, all parts of the primary structure shall be airworthy; (c) no parts of the primary structure shall suffer permanent detrimental deformation after removal of the limit load. Permanent deformation of the order of five per cent of that occurring at the limit load will usually be considered acceptable; (d) when a type of construction is used, for which experience is not available to show that compliance with static strength requirements is sufficient to ensure the strength of the structure under repeated loads, its strength shall be substantiated by a suitable series of repeated-load tests. Suitable factors of safety on fatigue loads shall be established in order to ensure that the probability of fatigue failure of the structure is extremely remote during the anticipated life of the airplane or parts thereof; (e) where transient stresses appreciably higher than those corresponding with the static load are produced as a result of structural flexibility in relation to rates of application of the specified loads, the structure shall be designed to withstand such transient stresses.

CALCULATIONS AND TEST PROCEDURES—When the structure is of a type for which experience has shown such methods to be reliable, calculations may be accepted as proof of compliance with the requirements prescribed in the preceding paragraph. In all other cases, substantiating tests shall be made. In making tests to establish compliance with ultimate load conditions, the ultimate load shall be applied for a period sufficient to demonstrate that the structure is capable of supporting the ultimate load; this period shall be not less than three seconds. In making tests to establish compliance with limit load conditions, the limit load may be applied rapidly, but in any case shall be supported for at least one minute. It is not intended that the loading should be so rapid that the effects usually associated with dynamic or shock loads are reproduced. When there is adequate statistical or other information which warrants it, simplified design criteria may be accepted, when such criterial will ensure a standard of safety not less than that obtainable by a rational investigation of the specified conditions.

Flight Loads

The air and inertia loads resulting from the specified maneuvers and gusts shall be so distributed as

Airworthiness Standards

for Commercial Aircraft in International Service

closely to approximate, or conservatively to represent, actual conditions.

DESIGN AIRSPEEDS — All structural design speeds shall be equivalent airspeeds, EAS. Estimated values of V_{s_1} and V_{s_0} may be used for structural design purposes, provided that the estimate is conservatively made.

V_{s_0} denotes the measured stalling speed, if obtainable, or the minimum steady flight speed, in mph CAS, with the engines idling, with throttles closed, or at not more than sufficient power for zero thrust at a speed not greater than 110 per cent of the stalling speed; the propeller pitch controls in the position recommended by the applicant for normal use during take-off; the landing gear extended; the wing flaps in the appropriate landing position as prescribed in the requirements in which V_{s_0} is the basis for specification; the cowl flaps or radiator shutters substantially closed; the center of gravity in the position within the allowable landing range giving the maximum value of stalling speed or of minimum steady flight speed; the weight of the airplane equal to the weight involved in a required item of performance which is specified in terms of V_{s_0}

Part II

Part 1 appeared in the September 15 issue. Part III will appear in Oct. 15 issue.

V_{s_1} denotes the measured stalling speed, *CAS*, with all engines idling, with throttles closed, or at not more than sufficient power for zero thrust at a speed not greater than 110 per cent of the stalling speed; the propeller pitch controls in the position recommended by the applicant for normal use during take-off; the airplane, in all other respects (for example, wing flaps, landing gear), in the particular configuration associated with the requirement in connection with which V_{s_1} is being used as a factor to specify a required performance.

The design airspeeds V_F, V_A, V_B, V_C, and V_D, shall be selected by the applicant (manufacturer), but shall be not less than the minimum values specified. These values shall apply at all altitudes, except as they may be limited to lower values by compressibility hazards. The design airspeeds selected shall be used in determining the airspeed operating limitations.

V_F—The design flap speed, power off, V_F min equals 1.4 V_{s_1} or 1.6 V_{s_0}, whichever is the greater, where V_{s_1} is the stalling speed, with wing flaps retracted, at design landing weight; this minimum value of V_F may be modified when devices are provided which automatically limit the load on wing flaps. (See Design Flap Speeds and Positions.)

V_A—The design maneuvering speed, V_A equals $V_{s_1}\sqrt{n_1}$, where V_{s_1} is the stalling speed, wing flaps retracted, at design maximum weight, and n_1 is the design value of the limit maneuvering load factor prescribed in Maneuvering Load Factors.

V_B—The design speed for maximum gust intensity, as defined in the V-n diagram, Fig. 2, by the intersection of the line representing the maximum static lift coefficient and the line representing the maximum prescribed gust intensity. (See Gust Envelope.)

V_C—The design cruising speed, V_C min shall be established on the following basis: V_C shall be sufficiently greater than V_B to provide for inadvertent speed increases likely to occur as a result of severe atmospheric turbulence. In the absence of a rational investigation substantiating the use of other values, the following shall be used: V_C min equals V_B +50 mph, but need not exceed 0.9 times the speed which the airplane is capable of attaining at maximum continuous power in level flight.

V_D—The design dive speed, V_D min shall be established on the following basis: V_D min shall be sufficiently greater than V_C to provide for safe recovery from inadvertent upsets occurring at V_C, and shall be sufficiently greater than V_A to provide for the execution of all permissible maneuvers within the operating limitations, without requiring exceptional skill on the part of the pilot. In the absence of a rational investigation substantiating the use of other values, the following shall be used: V_D min equals 1.25 V_C, or V_C +70 mph, whichever is the greater, but need not exceed the terminal velocity in a drive at 30 deg to the horizontal.

Note: During test flights, the airplane is required to be dived at speeds up to V_D min. The applicant (manufacturer) may therefore consider it desirable to provide structural strength for a greater speed, so as to safeguard the airplane during flight tests.

The airplane structure shall have sufficient strength to withstand the loads corresponding with all combina-

tions of airspeed and load factor on and within the boundaries of the V-n diagrams, Figs. 1 and 2. A sufficient number of points on the maneuvering and gust envelopes shall be investigated to ensure that the critical loads for each member of the airplane structure have been obtained; a conservative combined envelope may be used for this purpose, if desired. All significant forces acting on the airplane shall be placed in equilibrium in a rational or conservative manner. In establishing such equilibrium, it may be assumed that: (a) the loads on the wing and horizontal tail surfaces are balanced by linear inertia forces; and (b) the pitching moment produced by the aerodynamic load on the airplane are balanced by angular inertia forces.

MANEUVERING ENVELOPE—The airplane shall be assumed to be subjected to symmetrical maneuvers resulting in all possible combinations of airspeed and load factor represented on the maneuvering V-n diagram Fig. 1. Zero pitching accelerations shall be assumed, except under the conditions prescribed in Conditions Involving Pitch Acceleration.

MANEUVERING LOAD FACTORS—The values of n_1, n_2, n_3, n_4 on the maneuvering V-n diagram, Fig. 1, shall be not less than the following: $n_1 = 2.5$; $n_2 = 0$; $n_3 = 1.0$; $n_4 = 2.5$.

Note: (1) The values for the maneuvering load factors specified have been fixed as the minimum compatible with safety under closely controlled operating conditions. Consideration should, however, be given to amplifying these requirements to provide for other operating conditions, such as the following: (a) operations in which pilot technique, in respect of maneuvering loads imposed, is likely to vary with the size and maneuverability of the airplane; for such operations, acceptable values for the maneuvering load factors are as follows:

$n_1 = 2.1 + \dfrac{W \text{ lb} + 10{,}000}{24{,}000}$ but n_1 need not be greater than 3.5 and shall not be less than 2.5; $n_3 = 0.75\ n_1$; but n_3 shall not be less than 2.5. (b) unusual operating conditions (for example, flights through valleys in mountainous terrain), which require exceptionally maneuverable airplanes. Higher positive load factors may be required, depending upon the other airplane characteristics which affect maneuverability.

Note: (2) The value prescribed for n_4 may be reduced to not less than 2.0, provided that it is established that the airplane structure has sufficient strength to withstand combinations of loads arising from: (a) the simultaneous occurrence of a pull-up maneuver and an up-gust, and (b) the simultaneous occurrence of a pull-up and a rolling maneuver.

The values selected for the maneuvering load factor shall be used as a basis for establishing the operating limitations.

CONDITIONS INVOLVING PITCHING ACCELERATIONS—The following conditions of Fig. 1 involving pitching acceleration shall be investigated. These are usually critical for the horizontal tail surface and the rear portion of fuselage. Terms used in these conditions are as follows: a checked maneuver is one in which the pitching control is suddenly displaced in one direction and then suddenly displaced in the opposite direction, the displacements and timing being such as to avoid exceeding the limit maneuvering load factor or exceeding the pilot's strength. A sudden displacement of a control is one in which the rate of displacement does not exceed that which would actually be applied by the pilot. Account shall be taken of the assistance given to the pilot by tabs, adjustable tail settings, servo mechanism, and automatic devices.

(a) A_1 and A_2, Checked Maneuver at V_A—The airplane shall be assumed to be maneuvered to the positive maneuvering load factor n_1 by a checked maneuver from an initial condition of steady level flight at V_A. The following empirical formulae for the positive and negative pitching accelerations assumed to be attained simultaneously with load factors of 1.0 and the positive limit load factor n_1, respectively, are suggested.

When V_A is expressed in mph, the following pitching accelerations:

at A_1: $+\dfrac{45}{V_A}\, n_1\,(n_1 - 1.5)$ radians per sec per sec;

at A_2: $-\dfrac{30}{V_A}\, n_1\,(n_1 - 1.5)$ radians per sec per sec.

(b) D_1 and D_2, Checked Maneuver at V_D—The airplane shall be assumed to be maneuvered to the positive limit maneuvering load factor, n_1, by a checked maneuver from an initial condition of steady level flight at V_D. The following empirical formulae for positive and negative pitching accelerations assumed

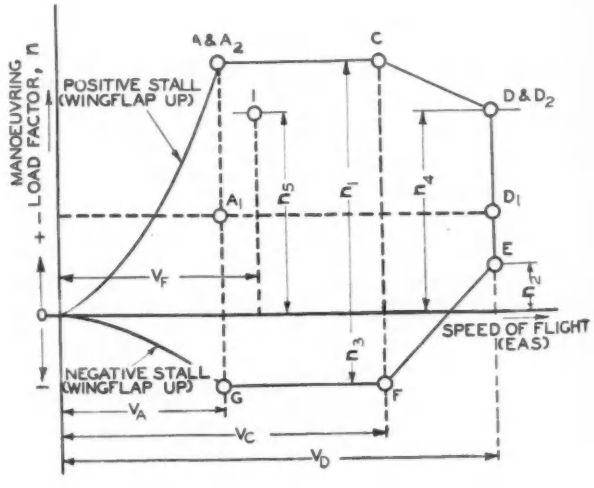


Fig. 1. Basic maneuvering envelope. Maneuvering load factor vs. velocity (V-n diagram).

to be attained simultaneously with normal load factors of 1.0 and the positive maneuvering load factor n_4, respectively, are suggested.

When V_D is expressed in mph, the following pitching accelerations:

at D_1: $+\frac{45}{V_D} n_4 (n_4 - 1.5)$ radians per sec per sec;

at D_2: $-\frac{30}{V_D} n_4 (n_4 - 1.5)$ radians per sec per sec.

Note: Pilot effort limitations are not applicable when the empirical formulae in (a) and (b) above are used.

Gust Envelope—The airplane structure shall be designed for the limit and ultimate loads resulting from encountering symmetrical up and down gusts perpendicular to the flight path, when the airplane is in straight level flight, as follows (Fig. 2 represents the defined conditions expressed in terms of airplane load factor and velocity): (a) 50 fps gusts when the airplane is flying at design cruising speed, V_C; (b) 25 fps gusts when the airplane is flying at design dive speed, V_D; (c) 66 fps gusts when the airplane is flying at the speed V_B at which the maximum angle of attack resulting from the gust is equal to the static stalling angle of the wing.

In the absence of information substantiating more accurate assumption, it shall be assumed that the gust builds up linearly from zero to the maximum specified values while the airplane travels a distance equal to 100 ft, or 10 times the length of the geometric mean chord, whichever is the lesser, and that the specified gust intensities are equivalent airspeed, EAS.

Note: When transient stresses are investigated in accordance with (e), in Strength and Deformation, a range of gust-gradient distances should be investigated.

HORIZONTAL TAIL SURFACE GUST LOADS—In calculating the horizontal tail surface loads, the airload increment due to the specified gust shall be added to the initial tail load corresponding to steady level flight. In determining the gust increment, allowance may be made for the effects of wing downwash, and equilibrium of pitching moments may be achieved by assuming appropriate pitching acceleration.

EQUIVALENT SHARP-EDGED GUSTS — The specified gust conditions may, for design purposes, be converted into equivalent sharp-edged gusts, provided that the stability and structural flexibility of the airplane are not abnormal. An acceptable approximation is to assume that the effect of a gust of maximum velocity U is a sudden change in the angle of attack of the wings by an amount equal to:

$$\tan - 1 \frac{FU}{V}$$

where, F is an alleviating factor computed by the formulae:

$$F = 0.3 \left(\frac{W}{S}\right)^{\frac{1}{4}} \text{ for } \frac{W}{S} \text{ less than 16 psf;}$$

$$F = 0.8 - \frac{1.6}{\left(\frac{W}{S}\right)^{\frac{3}{4}}} \text{ for } \frac{W}{S} \text{ greater than 16 psf}$$

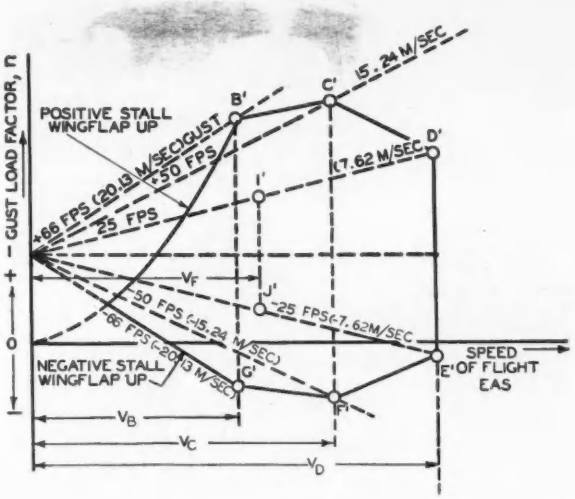


Fig. 2. Basic gust envelope. Gust load factor vs velocity (V-n diagram)

and V is the flight speed, *EAS; W* the appropriate airplane design weight, and S the design wing area.

The attitude and speed of the airplane are assumed to remain constant during the time required for the gust load to develop. The slope of the lift-coefficient/angle-of-attack curve is assumed to be that corresponding with static conditions.

Flight Loads with Wing Flaps Extended

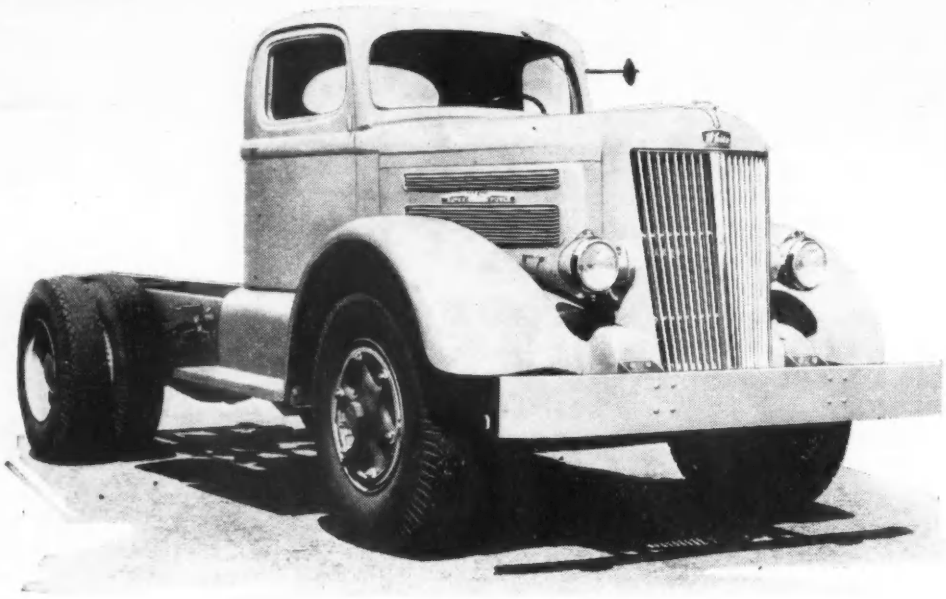
When wing flaps or other auxiliary high-lift devices, intended for use at relatively low airspeeds, are installed, the airplane structure shall be designed for the following conditions.

DESIGN FLAP SPEEDS AND POSITIONS—The airplane structure shall have sufficient strength to withstand the loads occurring in the symmetrical flight conditions of the following paragraph at the design flap speed V_F, chosen in accordance with Design Air Speeds, with wing flaps in the landing position, and with wing flaps in any intermediate position which produces critical loads in any part of the airplane. However, when automatic flap-load-limiting devices are fitted, the airplane structure may be designed for the critical combinations of airspeed and wing flap position permitted by the device. For the take-off wing-flap setting, consideration should also be given to the possibility that higher speeds may be required by the performance characteristics of the airplane.

SYMMETRICAL CONDITIONS WITH WING FLAPS EXTENDED—The airplane structure shall have sufficient strength to withstand the loads occur-

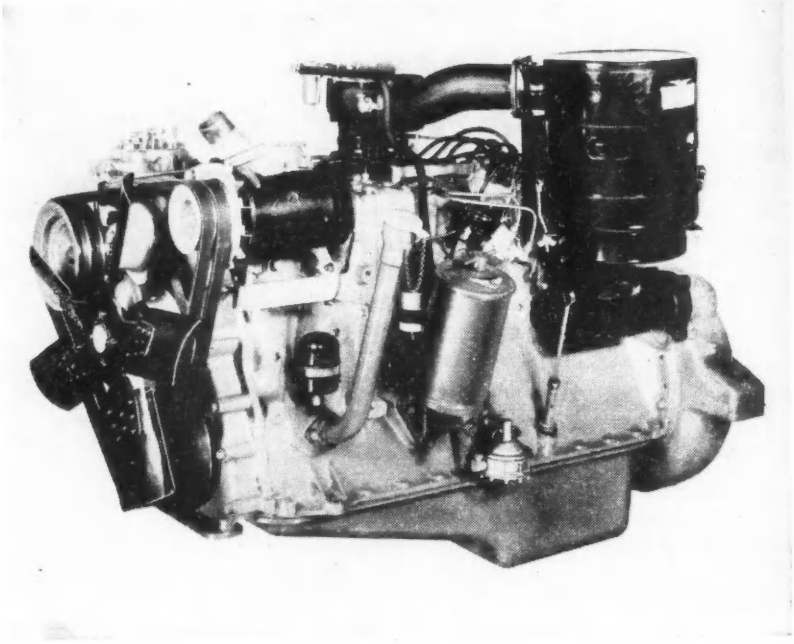
(*Turn to page* 85, *please*)

White N



(Left) White WB-28 tractor, 134 in. wheelbase.

(Below) Three-quarter left view of White's new engine.



AFTER a considerable period of preparation The White Motor Co., of Cleveland, has started production of its postwar WB Series of trucks, the line comprising 11 models ranging from GVW of 14,000 lb to 50,000 lb and wheelbases from 134 in. to 176 in. It includes four new models — WB-28, WB-28T, WB-2864 and WB-3264, the first three of which are powered by the new Super Power 260A engine of 170 hp and the WB-3264 by the new 280A engine of 184 hp. Rounding out the series are three 6-wheel and three tractor models. Specifications of the various models will be found in the accompanying table.

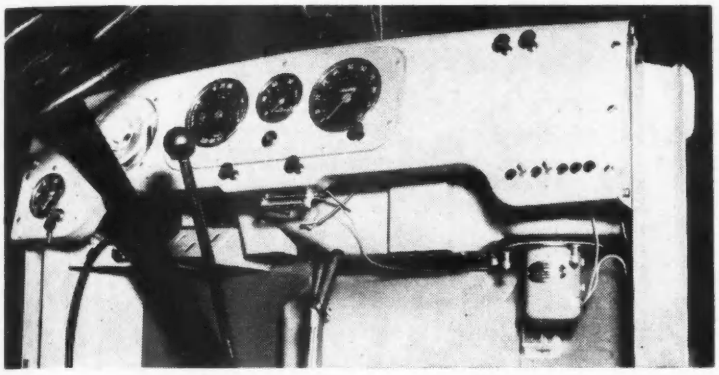
All of the Super Power engines in the current line represent an evolution of the basic engine design introduced by White some seven years ago and mark the basis for the development of the two large engines which have been added. Major features of design common to all White engines in current production are as follows: Stellite-faced sodium-cooled exhaust valves; Stellite-faced exhaust valve inserts; zero-lash hydraulic valve lifters; duplex carburetion with individual cylinder manifold ports; copper-lead engine bearings; Tocco-hardened crankshaft (seven-bearings); by-pass cooling system and positive crank-

Model	WB-14	WB-20	WB-20T
GVW Rating, lb	14,000	19,000	35,000
Wheelbase-CA, in.	136-60¼	136-60¼	136-60¼
Frame: Size, in.	8x3x¼	8x3x¼	8x3x¼
Channel	Single	Single	Single
Engine:			
Bore and stroke, in.	3 7/16x4½	3⅞x4½	3⅞x4½
Displacement, cu in.	250	318	318
Maximum torque, lb-ft	185	250	250
Maximum bhp	90	110	110
Clutch:			
Diameter, in.-Area, sq in.	11-124	12-149.5	12-149.5
Front Springs:			
Length and width, in.	39x2¼	39x2¼	39x2¼
Number of leaves	12	17	17
Rear Springs:			
Length, width, in.	54x3	54x3	54x3
Number of leaves—main	11	15	16
Number of leaves—auxiliary	5	7	8
Brake: Type	Hydraulic	Hydraulic	Hydraulic
Front lining—			
Diameter and width, in.	14x2	16¼x2¼	16¼x2¼
Thickness, in.	¼	⅜	⅜
Area, sq in.	124.5	154	154
Rear lining—			
Diameter and width, in.	16¼x3½	17⅜x4	17⅜x4
Thickness, in.	⅜	⅜	⅜
Area, sq in.	214	285	285
Hydrovac size, cu in.	2.36	3.5	3.5
Tires, Maximum	Front 8.25-20 Rear 9.00-20D	10.00-20D	Front 10.00-20 Rear 10.00-22D

*—Air compressor

New WB Series

of 11 Truck Models Ranging from 14,000 to 50,000 Lb. GVW



Instrument panel that is removable for access to wiring, oil line tubing, etc. The heating and ventilating equipment also can be seen in this view.

case ventilation utilizing intake manifold vacuum.

The new pressure-cooling system featured on all models is a closed system with pressure held automatically within a narrow range, under five pounds, and includes expansion tanks in the radiator to prevent loss of liquid. This eliminates the need for frequent refilling, permits the use of distilled water or permanent anti-freeze mixtures the year around. It is claimed that pressure cooling, coupled with refinements in the arrangement for cooling the block, and with a corresponding increase in core area has resulted in lower operating temperatures under the most severe service conditions. It is stated that an improvement of 15 per cent in cooling effect is conservative.

Stemming from military vehicle experience during the war is a new crankcase ventilating system common to all WB models. It consists of the familiar suction valve connected to the intake manifold which aids in eliminating blow-by vapors.

In addition White has adopted a more accessible type of air cleaner. Some refinements have been made in the electrical system, including an increase in generator output.

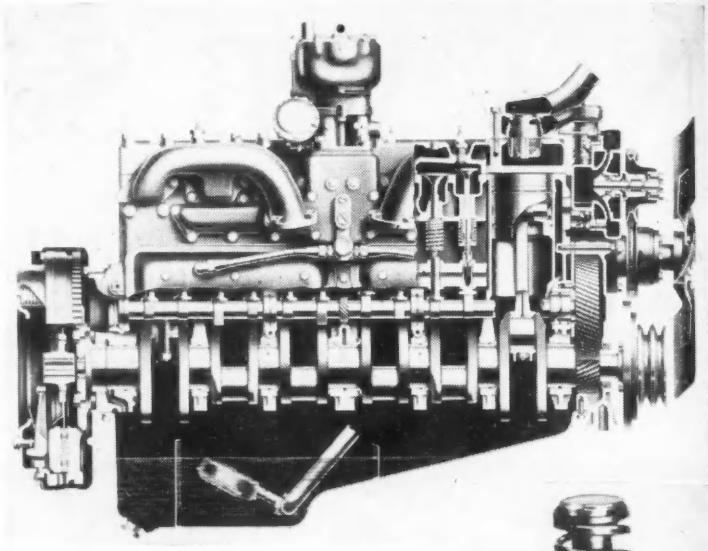
As to the two new engines the 260A is L-head, 6-cyl, 451 cu in. displacement, rated 170 hp at 3000 rpm, maximum torque of 350 lb-ft, with 6.25 to 1 compression ratio. The 280A engine is L-

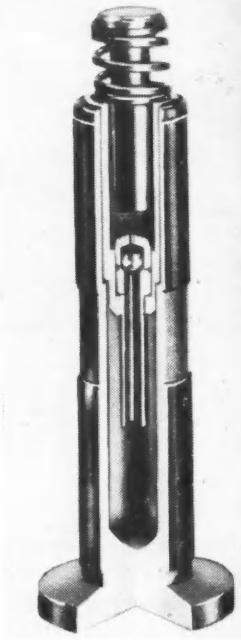
Specifications

WB-22	WB-22T	WB-26	WB-28	WB-28T	WB-2264	WB-2864	WB-3264
22,000	40,000	24,000	26,000	50,000 [1]	36,000	45,000	50,000
136-80¼	136-60¼	136-60¼	134-60	134-60	160-84¼	176-102	176-102
8⅛x3 1/16x5/16	8⅛x3 1/16x5/16	8⅛x3 1/16x5/16	8⅛x3 1/16x5/16	8⅛x3 1/16x5/16	8⅛x3 1/16x5/16	8⅛x3 1/16x5/16	8¼x3½x⅜
Single	Single	Single	Single	Single	Double	Double	Double
3⅞x5⅛	3⅞x5⅛	4x5⅛	4⅜x5	4⅜x5	4x5⅛	4⅜x5	4⅝x5
362	362	386	451	451	386	451	504
285	285	315	350	350	315	350	405
125	125	135	170	170	135	170	184
13⅞-220	13⅞-220	13⅞-220	15½-250	15½-250	13⅞-220	15½-250	15½-250
39x2¼	39x2¼	41x2½	41x2½	41x2½	41x2½	41x2½	42x3
20	20	19	19	19	17	19	13
54x3	54x3	54x3½	54x3½	54x3½	48x4	52x4	54¼x5
16	17	13	13	14	12	13	17
8	8	5	5	5	None	None	None
Hydraulic	Hydraulic	Hydraulic	Hydraulic	Hydraulic	Hydraulic	Air	Air
16¼x3½	16¼x3½	16½x3½	16¼x3½	16¼x3½	16¼x3½	16½x4	16½x4
⅜	⅜	⅜	⅜	¾	⅜	¾	¾
214	214	214	214	214	214	244	244
16½x6	16½x6	16½x6	16½x6	16½x6	17¼x4	16½x6	17¼x5½
¾	¾	¾	¾	¾	⅜	¾	¾
415	415	415	415	415	504	724	800
6	6	6	6	6	6	7.25 cu ft.*	7.25 cu ft*
11.00-20D	11.00-20D	11.00-22D	11.00-24D	11.00-24D	10.00-20DD	11.00-22DD	12.00-24DD

head, 6-cyl, 504 cu in. displacement, rated 184 hp at 3000 rpm, maximum torque of 405 lb-ft with compression ratio of 6 to 1. While endowed with the general features common to all engines in the line, the engines have these additional features. The intake manifolds are water-cooled and considering the high power output the entire cooling system is reported free from hot spots to permit the use of high compression heads with commercial gasoline. Higher volumetric efficiency is claimed because of better filling of the large cylinders. An innovation on these two engines is the gear driven fan, which permits lowering of the fan to a more accessible location and more favorable to better cooling. The water pump and generator are driven by belt from the fan mounting.

The Centri-Vac governor standard on these engines, combines the advantages of mechanical and vacuum type governors. A new type of oil pump with greatly increased capacity, particularly at idling speeds, has been adopted.

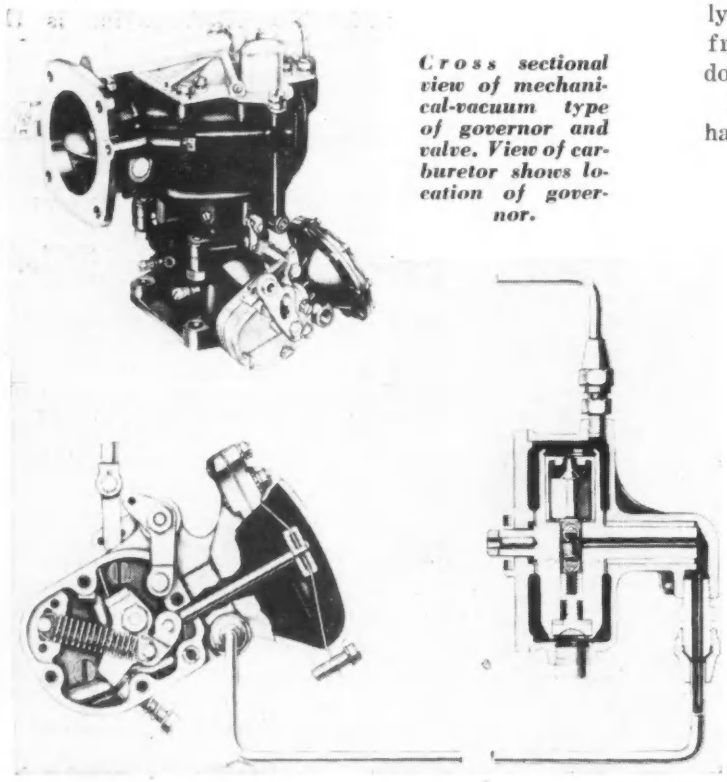




Cutaway view of right side of the new truck engine. Inset shows hydraulic valve lifter.

For the benefit of the driver, basic improvements have been made in front end suspension as well as the adoption of a unique cab design. Cab features are the result of experiments carried on during and since the war in seating and suspension to improve the driver's posture, increase his comfort, and thus reduce driving fatigue. One result is an improved front seat construction and increased headroom in the cab.

To take care of ventilation and comfort heating of the cab during the extremes of hot weather and humid close atmosphere in winter, White has adopted an advanced form of controlled heating and ventilating with temperature control by an adjustable automatic thermostatic device operated by the driver. It changes air in the cab a number of times per minute and provides a fresh clean atmosphere with windows closed, relatively free from the usual frosting of side windows.



Cross sectional view of mechanical-vacuum type of governor and valve. View of carburetor shows location of governor.

In front end suspension twin-back front springs have been adopted in conjunction with heavy duty double-acting shock absorbers to produce a cushioned ride for the driver and load. Ease of control also comes from the adoption of the cam and twin-lever steering gear which relieves the manual effort in steering. Combined with improved steering geometry it reduces turning radius, increases maneuverability, and is said to promote vehicle stability under all road and load conditions, at higher speeds.

One of the novel features of the new cab, in the interest of improved maintenance, is an easily removable instrument panel which makes accessible all of the wiring harness, cables, and plumbing when inspection or servicing is required.

Five-speed transmissions are standard in all models while three-speed auxiliary transmissions are added on the WB-2864 and WB-3264 vehicles. Optional ratios with di-

(*Turn to page 54, please*)

Copper

and Its Alloys in Automobiles

SOME interesting data compiled by the Copper and Brass Research Association and the Automobile Manufacturers Association disclose that large quantities of copper and copper alloys are used each year by the automotive industry. AMA estimates that the amount of copper used in manufacturing motor vehicles, repair parts and accessories in 1939 was 110,000 tons, which represented 13.7 per cent of the total United States copper consumption for that year. In 1941, 97,000 tons of copper were used in the manufacture of passenger cars and 26,000 tons in trucks, a total of 123,000 tons.

Had labor conditions permitted, the automotive industry would have probably consumed 125,000 tons of copper and its alloys this year, according to the Copper and Brass Research Association, which has obtained the following data on the content of copper, brass and bronze in several makes of 1946 passenger cars. Some 50 different parts of the average 1946 model passenger car are made of these metals, their total content ranging from 37 to 74 lb per car.

There are about 50 lb of copper and copper alloys in the 1946 model Ford. The radiator has 27 lb, 17 lb in the copper fins and 10 lb in the tubes, headers and tanks. The copper content of the generator, starter, and wiring is 4.2, 3.7 and 3.8 lb respectively. There are three lb of copper in cast iron and steel and eight lb or more of small brass and bronze parts.

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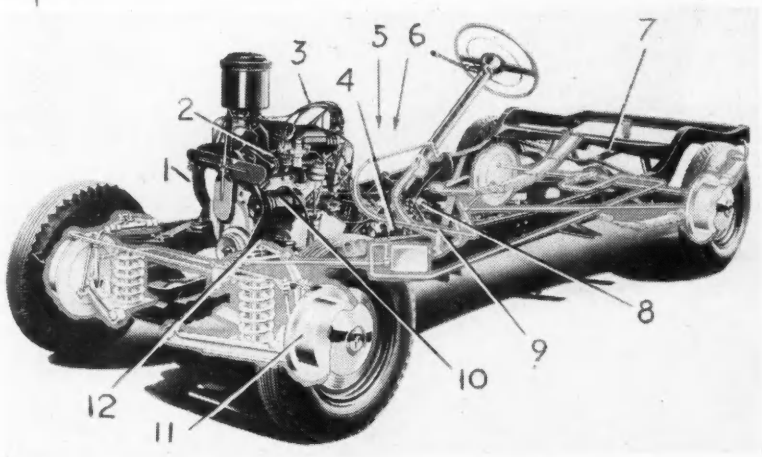
Total Pounds of Copper, Brass and Bronze in 1946 Passenger Cars

Buick	50	Hudson	50.5
Chevrolet	37	Packard	59
Ford	49.7	Nash 600	40
Mercury	53.7	Nash Ambassador	50
Lincoln	64.7	Kaiser	52
Chrysler Six	51.9	Frazer	52
Chrysler Eight	73.8		

Parts of a 1946 Chevrolet Made from Copper, Brass and Bronze

	Copper	Brass	Bronze
Accelerator pedal insert	—	X	—
Air cleaner and silencer	X	—	—
Brake main cylinder parts	X	—	X
Brazing in steel piping	X	—	—
Body door sliding shoes	—	X	—
Carburetor parts	X	X	—
Chassis and body electrical wiring	X	X	X
Cooling system thermostat	—	X	—
Cigarette lighter	—	X	—
Clock	—	X	X
Crankshaft and connecting rod shims	—	X	—
Camshaft thrust plate	—	—	X
Cylinder head water nozzles	X	—	—
Drain cocks for radiator and engine	—	X	—
Gasoline tank parts	—	X	—
Gaskets	X	—	—
Generator	X	X	X
Headlamps, taillamps, license lamp, parking lamp, dome lamp and instrument lamps	X	X	X
Horns and horn relay	X	X	—
Hub caps	—	X	—
Hood name plate	—	X	—
Ignition distributor and vacuum control	X	X	—
Ignition coil	X	X	—
Indicator instruments	X	X	X
King pin bushing	—	—	X
Lock parts for body locks and ignition switch	—	X	X
Light switches	X	X	X
Piping, connections, and fittings	X	X	—
Piston pin bushings	—	—	X
Radiator body	X	X	—
Rivets, clutch and brake facing	—	X	—
Shock absorber bushings and internal parts	—	—	X
Starting motor	X	X	X
Transmission synchronizer cone	—	—	X
Transmission counter gear bushings	—	—	X
Transmission counter gear thrust washers	—	—	X
Transmission idler gear thrust washers	—	—	X
Transmission reverse idler bushings	—	—	X
Transmission gearshift control shaft bushing	—	—	X
Torque tube bushings and liner	—	—	X
Voltage and current regulator	X	X	—
Water pump internal parts	—	X	X
Windshield wiper mechanism parts	—	X	—
Window ventilator pivot and cap	—	X	—

In addition several parts use copper plating, notably those parts which are finished in chrome plating.

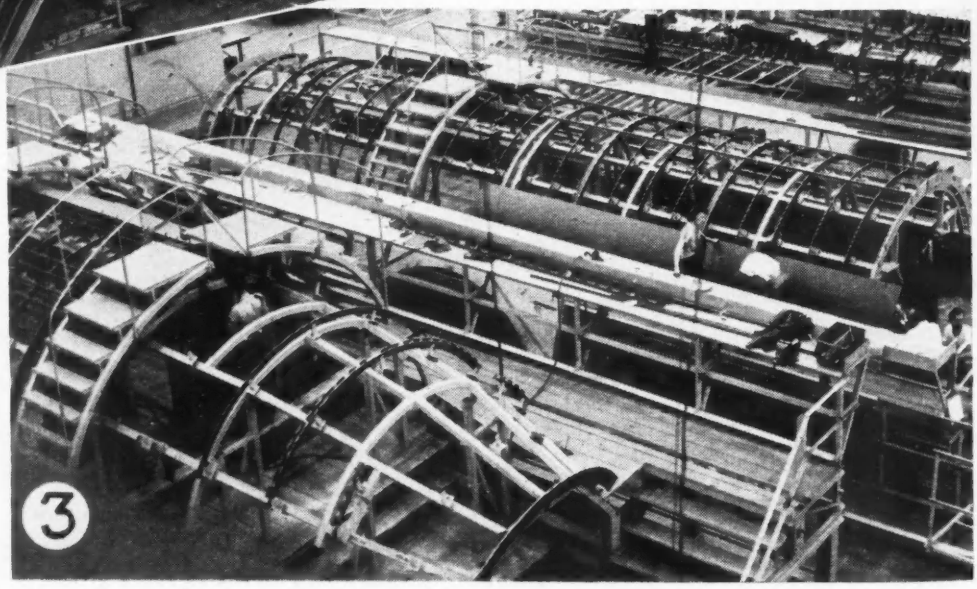


Hudson Six chassis showing the use of copper and its alloys. In addition trim and other fixtures contain quantities of these metals.

1—Copper radiator core (not shown)
2—Bronze wrist pin bushings
3—Copper electrical wiring and switches
4—Copper commutator and windings in starting motor
5—Copper heater motor, radio and electrical gages (not shown)
6—Copper heater core (not shown)
7—Bronze differential thrust washers
8—Bronze thrust washers and synchronizer cones in transmission
9—Bronze control shaft bushings
10—Copper commutator and windings in generator
11—Brass brake lining rivets
12—Brass oil reservoir screens

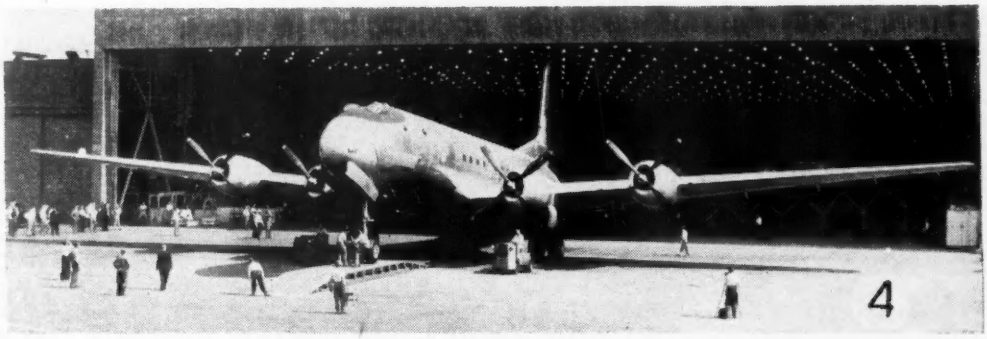
1. *Production line of the C-74 Globemaster transport, newest and largest Army Air Forces cargo plane, at the Long Beach plant of Douglas Aircraft Co. Four of them stretch the line back 5555 ft.*

2. *(Left) Tail stub jig; (Right) Tail cone jig;*

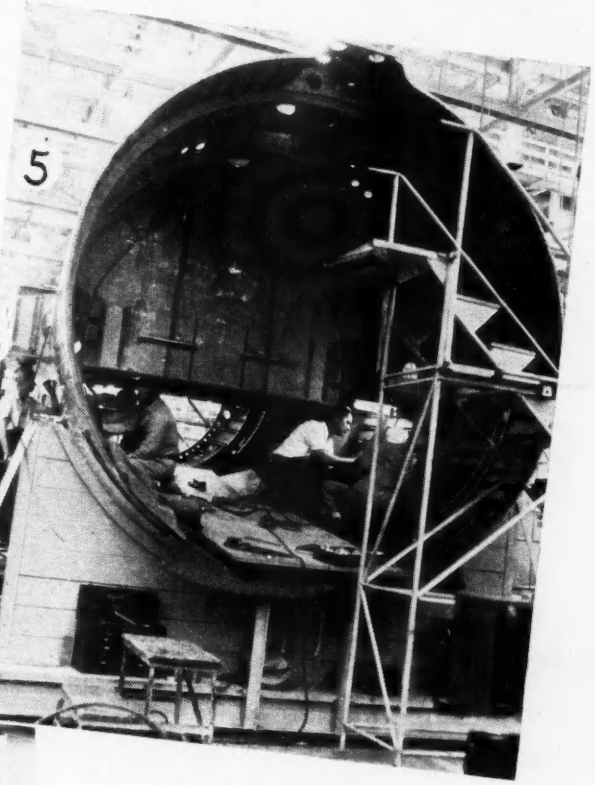


3. *Framing and skinning on front and rear upper half sections of the 124 ft. long fuselage.*

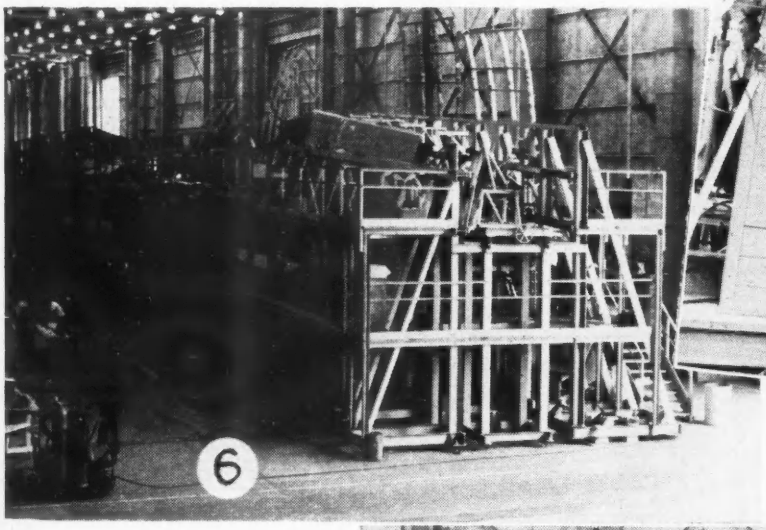
Globemaster in Production



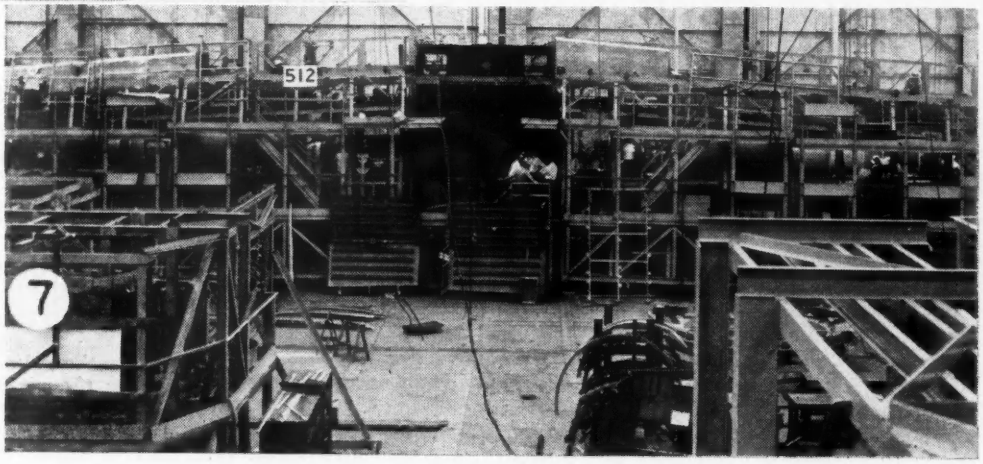
4. *Douglas plant engineers devised this ramp over which the nose wheel rolls, thus dipping the 43½-ft tail sufficiently to clear the 42-ft door. The C-74, powered by four P & W Wasp Major 3000 hp engines, has a fuel capacity of 11,000 gal and can fly 8000 miles nonstop. Top speed is 325 mph and gross weight 145,000 lb, including load capacity of 125 troops or 30 tons of cargo.*



5. *Working on interior of tail stub after its removal from jig.*



6. *End view of three-tier wing jig, of which there are two. Wing span of C-74 is 173 ft.*



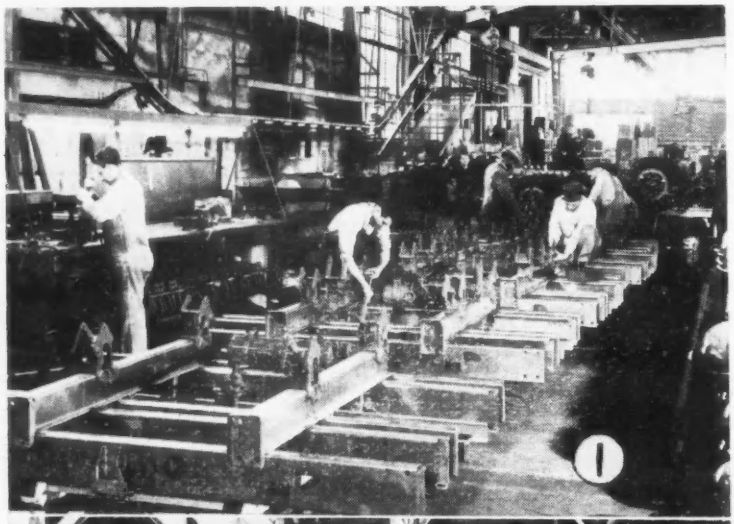
7. *Wing center section being assembled in jig.*

Stainless St

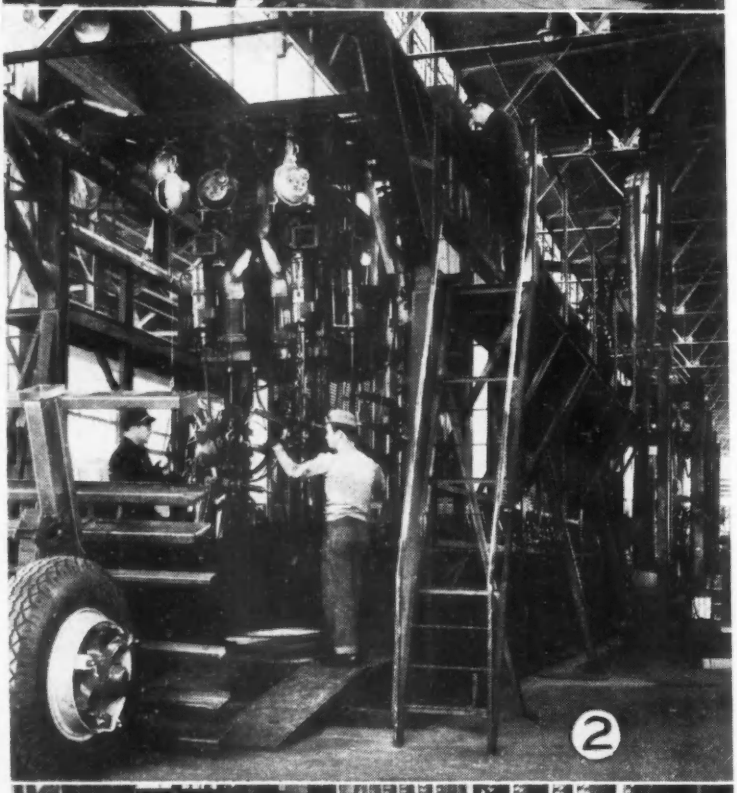
By Joseph Geschelin

PIONEER in the field of stainless steel trailer manufacture, the Fruehauf Trailer Co., recently transferred all stainless steel body operations to its Fort Wayne, Ind., plant which now produces the entire vehicle assembly with either single-axle or tandem-axle chassis ready for shipment to the customer. Just before the war all manufacturing operations were concentrated in the Detroit plant as described in an article "Fruehauf Custom Bodies in Mass Production," AUTOMOTIVE INDUSTRIES, Dec. 1, 1940. At that time stainless steel bodies were assembled as a separate structure in massive fixtures, later installed on the chassis in conventional manner. Production was discontinued during the war years when stainless steel was a critical material ear marked exclusively for military uses.

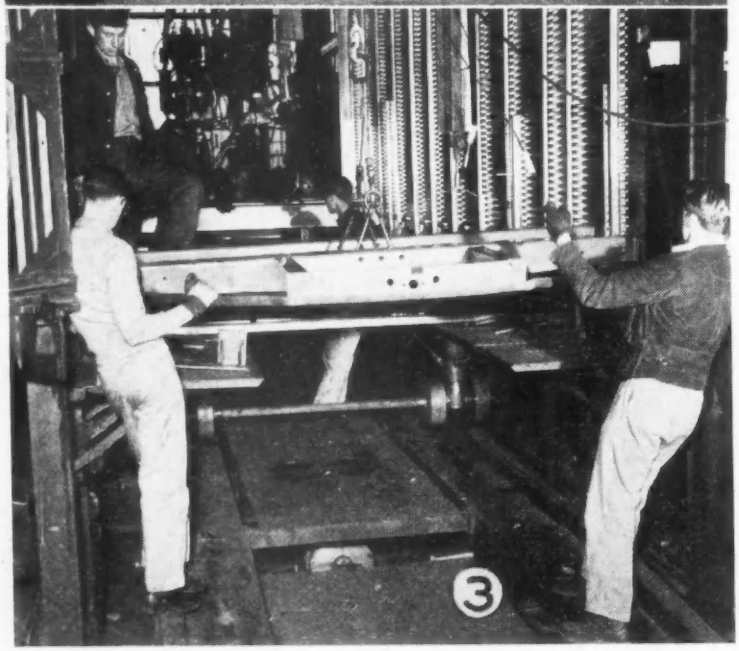
Immediately after the war plans were laid for mass production at Fort Wayne. With this shift in scene to a large modern building the management was given an opportunity to make radical changes in manufacturing techniques based upon the know-how developed in early production plus the new developments made available in the intervening years. The Fort Wayne plant has two parallel installation lines designed to keep pace with accelerating demand for stainless steel equipment. Each line has three principal framing stations for shotwelded assembly operations. Apart from certain changes in



1. ***Fruehauf stainless steel trailer assembly begins at this initial assembly line on which the underconstruction takes form. Here the rear frame section is being built up to take the suspension, axles, wheels, etc.***



2. ***This enormous structure is the first welding and framing fixture being prepared for body assembly. The rear underconstruction may be seen at the left ready to roll onto the ramp in the fixture***



3. ***Another view of the first station showing the vertical support assembly and front underframe being guided into position in the fixture ready for clamping to the body sides and nose***

Steel Trailer Operation

Reorganized by Fruehauf

body structure design, the distinguishing feature of current methods is that the stainless steel chassis subassemblies are prepared on a separate assembly line, then shifted to the first framing fixture to serve as the backbone for body assembly.

As before, the basic shotwelding technique developed by Budd many years ago and refined since then is employed for joining all stainless steel members. All of the portable welding guns used in conjunction with the framing fixtures are made by Progressive Welder Co., and each one incorporates a system of water cooling for the electrodes, and hydraulic pressure clamping of the work controlled by a special air-hydraulic booster mounted on the transformer. Each of the welding guns is controlled in its cycle of operations by a separate General Electric Thyratron control cabinet, including an automatic weld recorder and audible warning signal.

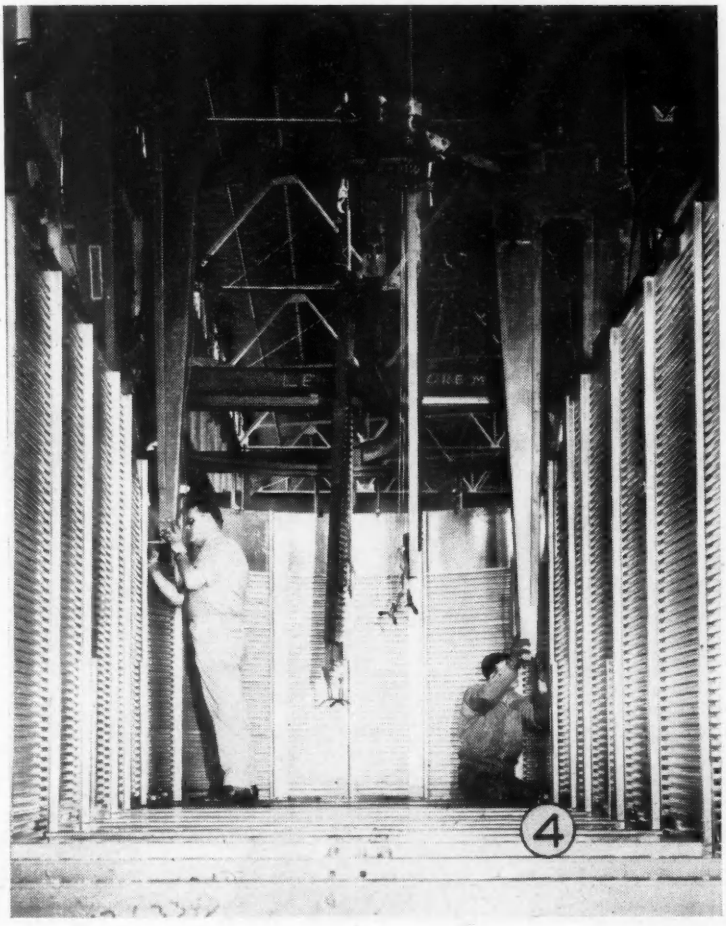
This type of control, evolved over a period of years, provides guaranteed proof welds for each of some 10,000 spots required for the structure. As each gun starts its operation the recorder indicates each weld on the tape, thus providing a permanent record of quality for each weld for each vehicle. During the operation, if an off-standard quality weld is produced the control cabinet gives a warning signal and shuts off the gun. The gun setting can then be corrected and the offending weld repaired.

The adjustment and condition of each gun is tested before starting a new body. As a double-check the actual operation of each gun is proof tested before work is started. For this purpose, the operator prepares a weld specimen which is immediately pulled in a Baldwin-Southwark tensile testing machine. The strength of the weld specimen must come within established limits before the OK to go ahead is given.

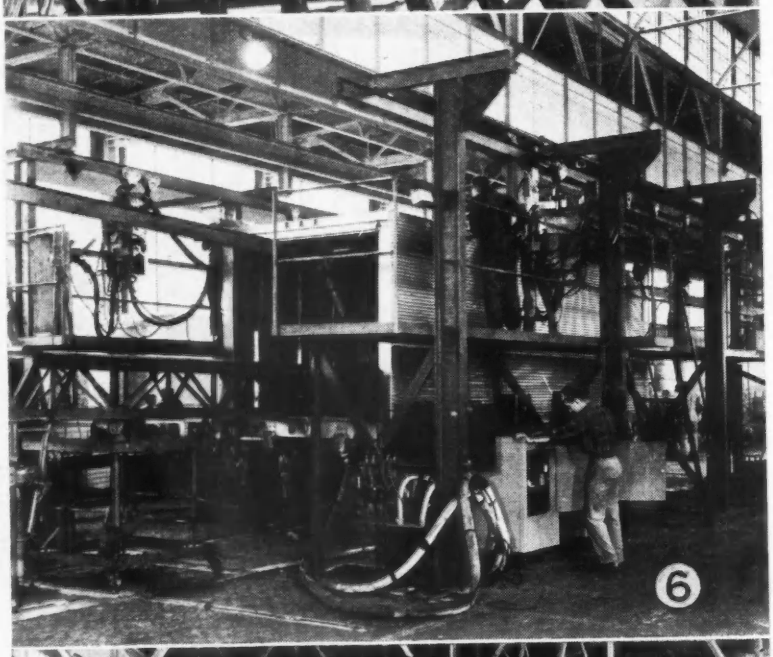
As to the details of the assembly operation, the first step is the assembly of the underconstruction consisting of its subframe, suspension, axles, wheels and tires, etc. The assembly is started up-side-down to facilitate the installation of running gear units and is turned over and set on its wheels in normal position on completion. Similarly, the assembly line builds up the front support subassembly and the front underframe Upon completion, these subassemblies are ready for the assembly of the vehicle in the first framing fixture. The rear underconstruction (see illustration) is rolled into the fixture and is then hoisted into place. Then the front support and front underframe are installed in the fixture.

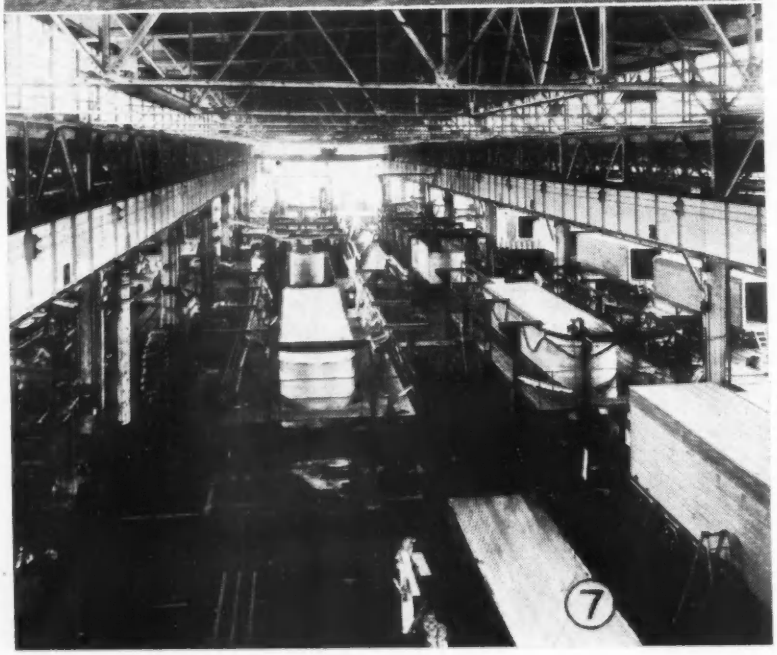
To go back a little, it should be mentioned that all of the principal subassemblies that go to make up the body are produced by Budd in Philadelphia. These consist of the two side panels with their framing, the nose or forward section, the roof or top, and the chassis frame sections. These parts are completely assembled by Budd and are ready for installation when received at Fort Wayne.

After the underframe sections have been lifted into



4. ***As the tack-welding of the sides and nose to the frame backbone proceeds, the nose section is shotwelded completely, using the two enormous Progressive guns which have a throat depth of 100 in. The operators on the outside of the fixture work on an elevating platform***





position in the first fixture, the operators install the two side panels and the nose section, carefully matching each section to assure proper fit. Then the various subassemblies are securely clamped by means of a series of hand clamps attached to the fixture. This procedure assures positive alignment throughout.

The operation in the first welding fixture is primarily that of tack-welding the sides and nose to the frame. However, the nose section is completely welded to the frame and to the sides at this point. This is done through the use of two deep-throated welding guns vertically mounted at the nose section to the fixture. Said to be the largest of their type in use today, these Progressive guns have a throat depth of 100 in. The long arms are of stainless steel—to reduce weight and mass—and carry large copper bus bars to conduct current, thus eliminating unsightly and unsafe outside cables. There are four operators for the two big guns—two inside and two outside. The operators on the outside move with the guns on an elevator platform which serves to facilitate the operation and reduce fatigue.

Upon completion of this operation, the entire assembly is lowered onto its wheels and rolled into the second welding fixture, remaining on its wheels from that point on. Principal welding operations here are the shotwelding of 10 hat-shaped stainless steel floor stringers to cross members to add strength and rigidity. In addition there is the welding of the filler to the nose section, and joining of the vertical support diagonals and cross member end flanges. A number of detail parts also are added to the assembly by arc welding at this point.

The assembly—still without roof—now is rolled into the third fixture where

(*Turn to page 77, please*)

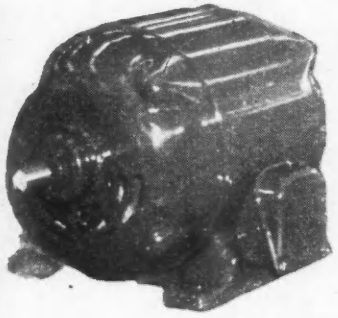
5. ***The vehicle rolls on its wheels into the second of the framing fixtures shown here, the principal operations being the shotwelding of the 10 hat-shaped stainless steel floor stringers***

6. ***View of the third major framing fixture in which the roof is fitted and welded to the side and nose sections. The G-E Thyratron control cabinet may be seen in the foreground. At the left is the elevated rail carrying the two Progressive guns used for interior welding operations***

7. ***Perspective view of the stainless steel manufacturing department at Fort Wayne showing the two welding lines in the foreground***

are as thick as they would be if made from cast iron.

Steel construction has resulted in smaller size units. Size is also reduced by an improved engineered cooling system. Losses in a motor are inherent and are dissipated in the form of heat. Temperature rise beyond a certain point is not allowable because of detrimental effects on electrical insulation and the heat must be carried away

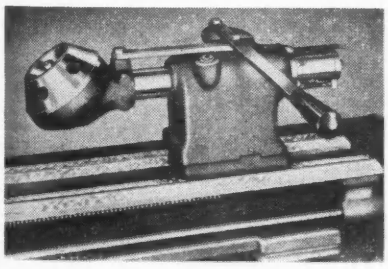


Westinghouse Life-Line motor

from the motor. Most of it is transferred to air blown over the hot surfaces. Much more air passes through this motor than through its predecessor, thus permitting the reduction in size of the cooling surfaces while adequately maintaining temperature limits.

A NEW tailstock-type handlever turret has been designed to give turret lathe efficiency to 9-in. South Bend lathes on jobs which require a number of successive operations.

Made by the South Bend Lathe Works, 119 E. Madison St., South Bend 22, Ind., this turret mounts on the inside ways of the bed in place of the tailstock. A six-station turret head



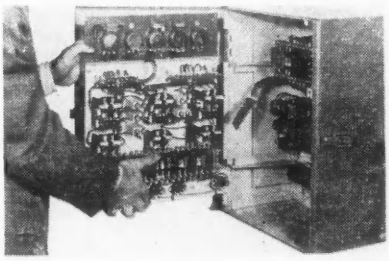
South Bend tailstock-type handlever turret

accommodates tools with ⅝-in. diameter shanks. The length of the cut at each station is regulated by means of an adjustable set screw. A stop mechanism is geared to operate automatically in unison with the indexing of the turret head. The index lock releases automatically at the end of the turret slide's return stroke, and indexing is done by hand. Operations can be repeated, or skipped, at will. The turret slide has a maximum stroke of 3¼ in.

THE CONTROL DIVISION of General Electric Co. has redesigned its complete line of sequence and sequence-weld timers for resistance welding. The new design permits quick change of the welding sequence, easy inspection and maintenance, and remote operation. It includes an improved electronic timing circuit which makes possible the consistent welding speed essential to high-production welding with short timing intervals.

The sequence timer coordinates the mechanical operation of an air- or fluid-operated spot or projection welder with the flow of welding current, as determined by a synchronous-precision weld timer. For less exacting applications, the sequence-weld timer provides the necessary control of both mechanical sequence of operation and non-synchronous control of weld time. Both can be used with all standard control combinations in which ignition contactors or synchronous-precision timers are used.

All electrical connections between the front and rear panels are made by plug connectors so that the front panel, or timing control section, can be removed in less than a minute and placed in another machine. This permits quickly replacing any one of a number of similar timing control sections with a single spare unit. In addition, timing control sections of different types can be interchanged without rewiring.



G-E sequence-weld timer with front panel removed to expose interior of case

The initiating circuit, normally 115 volts, can be changed to 24 volts, and a two-stage foot-switch can be added at any time. All 60-cycle panels are suitable for operation on 208, 230, 460, or 575 volts, 50 or 60 cycles, and panels are available for other frequencies.

ALL-STEEL PALLETS have been added to the line of material-handling equipment made by the Monroe Auto Equipment Co., Monroe, Mich. Manufactured of high tensile steel, the pallets and other all-steel items in the line are said to average 40 per cent less in weight than units of comparable size formerly made of hot rolled steel. A 48 in. by 48 in. pallet size, for example, weighs 46 lb less than its hot rolled steel predecessor. In point of strength and load-bearing capacities, the high tensile steel products are equal to, or greater than, similar units of other materials.

The new Monroe pallets are standardized in size to fit into railroad and truck equipment as well as storage facilities built for modern industrial material handling truck operations. Three sizes are designed to fit the shipping requirements of modern packages, most of which have at least one dimension of 12, 24 or 48 in. to give easier and more compact pallet loading.

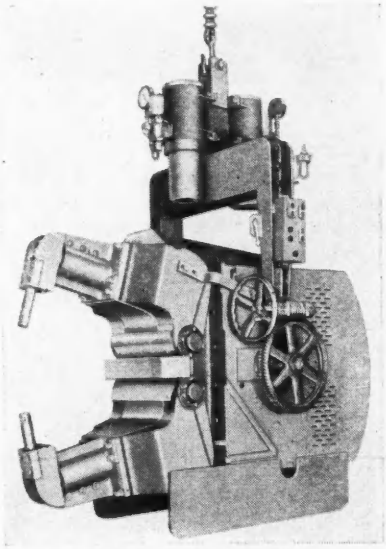
SEVERAL versions of a huge portable welding machine have recently been built and shipped by Sciaky Bros., Inc., 4915 W. 67th St., Chicago, Ill. The welders are capable of welding up to three thicknesses of ½-in. structural steel without removing the rust and scale usually present on this material. Application is primarily for speeding pre-fabrication of large structural units in shops.

Other uses include mass production of large assemblies in railroad, marine, truck and bus shops, where parts may be joined by overlapping or flanges.

Welding through the rust and scale is accomplished by a special electronically-controlled sequence which provides (1) a pre-weld period of high pressure and low current which burns off oxide, allows perfect fit of parts and reduces electrode tip deterioration, (2) a high-current welding period during which electrode pressure is reduced for greater efficiency, and (3) a post-weld period which retains the high current under high pressure to prevent coarse structure and internal cracks. Current is interrupted and high pressure retained for a final forging action.

Where high carbon steels (above .20 per cent) are to be welded, a special quench and post-heat period is provided which is said to effectively eliminate

(*Turn to page* 60, *please*)



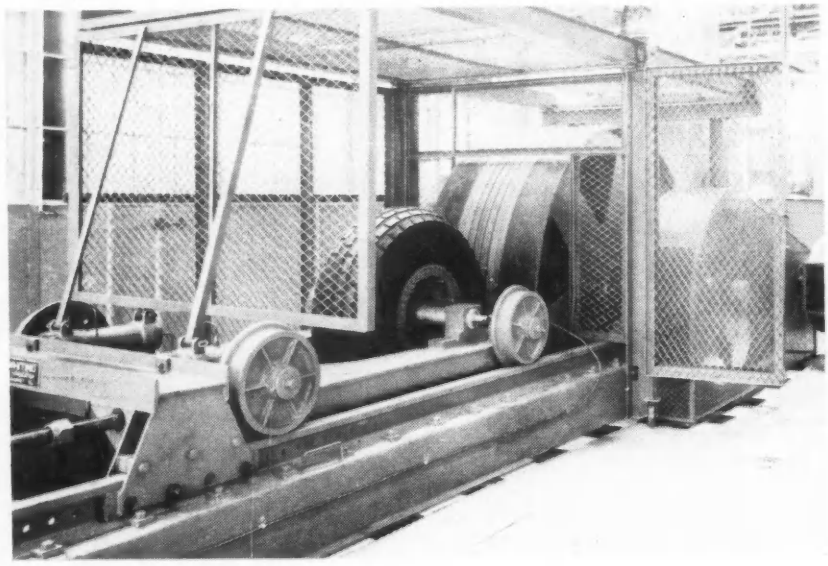
Sciaky portable welder

Weight of Steel Purchased for a Typical Automobile in Pounds

BODY		
Wire products	83.76	
Hot rolled sheets and strip	514.06	
Cold rolled sheets and strip	347.01	
Plates	6.22	
		951.05
CHASSIS SHEET METAL		
Wire products	3.38	
Hot rolled sheets and strip	37.67	
Cold rolled sheets and strip	284.37	
		325.42
ENGINE AND CLUTCH		
Hot rolled bars	160.97	
Cold rolled bars	13.23	
Wire products	4.56	
Structural shapes	2.46	
Hot rolled sheets and strip	25.92	
Cold rolled sheets and strip	7.14	
Plates	17.00	
Terne plate	3.50	
		234.78
TRANSMISSION		
Hot rolled bars	33.18	
Cold rolled bars	9.97	
Wire products	3.32	
Pipe and tubes	3.56	
		50.03
FUEL TANK AND EXHAUST SYSTEM		
Hot rolled sheets and strip	9.28	
Cold rolled sheets and strip	5.33	
Terne plate	22.89	
		37.50
FRAME		
Structural shapes	23.46	
Hot rolled sheets and strip	307.87	
Plates	6.17	
		337.50
FRONT END SUSPENSION		
Hot rolled bars	87.90	
Cold rolled bars	6.37	
		94.27
REAR AXLE AD REAR END SUSPENSION		
Hot rolled bars	138.68	
Cold rolled bars	3.24	
Wire products	3.33	
Hot rolled sheets and strip	32.38	
Cold rolled sheets and strip	10.67	
Plates	12.46	
Pipe and tubes	2.24	
Terne plate	4.95	
		207.95
STEERING MECHANISM		
Hot rolled bars	6.10	
Cold rolled bars	6.74	
Wire products	2.42	
Pipe and tubes	2.94	
		18.20
BRAKES, WHEELS AND TIRES		
Cold rolled bars	5.42	
Wire products	6.50	
Hot rolled sheets and strip	199.14	
		211.06
BUMPERS, GUARDS, ETC.		
Hot rolled bars	13.21	
Hot rolled sheets and strip	37.70	
Cold rolled sheets and strip	28.62	
		79.53
CHASSIS ELECTRICAL SYSTEM INSTRUMENTS		
Cold rolled sheets and strip	7.12	
		7.12
OTHER PARTS NOT MENTIONED PREVIOUSLY		
Hot rolled bars	91.95	
Cold rolled bars	36.32	
Wire products	79.73	
Hot rolled sheets and strip	488.05	
Cold rolled sheets and strip	273.22	
Plates	3.35	
Pipe and tubes	1.61	
Terne plate	11.78	
Structural shapes	4.11	
		990.12
Total for car		3,544.53

The above data, which were supplied to the American Iron and Steel Institute by a large automobile manufacturer, represents the average weight of steel per car purchased by the company for its entire 1942 line from low-priced models to high-priced models. Of the total of 3545 lb, approximately 2615 lb was sheet and strip steel.

Bendix Roll Test Machine



BENDIX has placed in operation this new roll test machine which was designed by company engineers for testing the strength of aircraft wheels. In operation, the flywheel is rotated up to the specified speed, corresponding to the landing speed of the airplane and the hydraulically operated carriage pushes the tire against the flywheel. This causes the wheel to roll under conditions simulating the actual use of the wheel on an airplane during take-off and landing. When the airplane wheel has been operated for the specified time, without failure, the conditions requiring the roll test have been met.

The flywheel used to simulate ground speed of the airplane is 8.0 ft in diameter and has a 3.0 ft face. It is made of steel plates welded together and revolves on taper roller bearings. This wheel which turns from 50 to 420 rpm is capable of turning the equivalent of 120 mph landing speed. A 125 hp d-c, variable speed motor, with motor generator set, furnishes power to turn the flywheel.

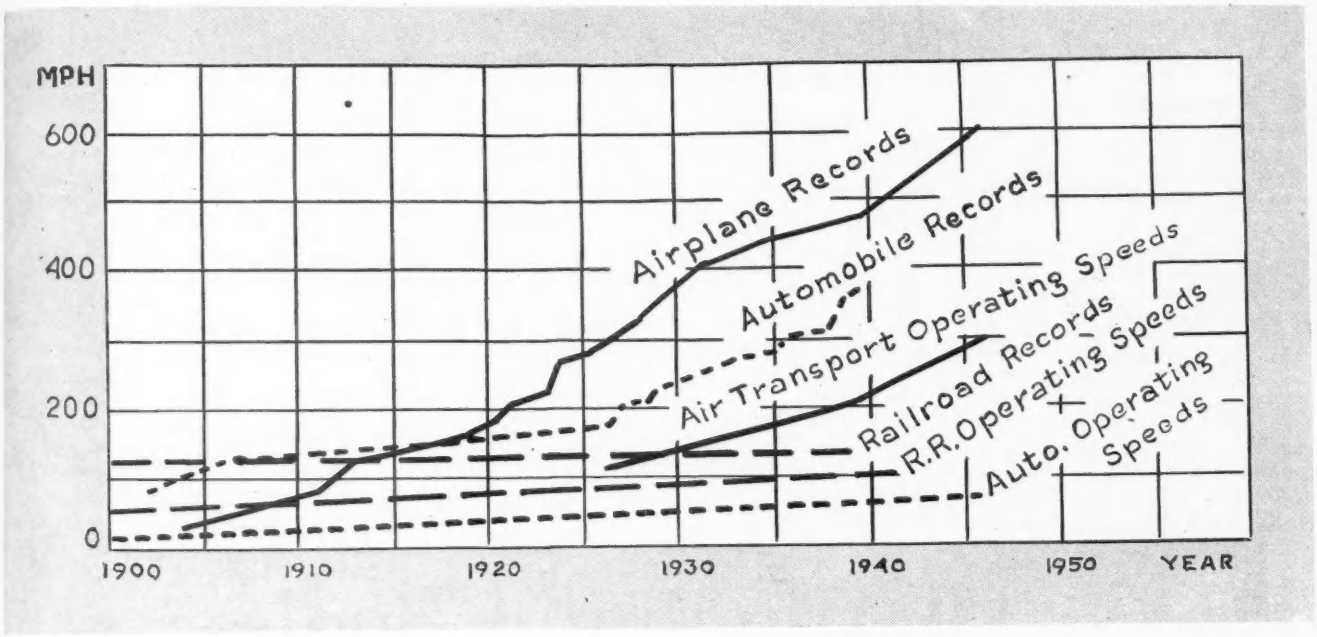
The carriage rolls on 100 lb steel rails anchored to the reinforced concrete base. It is actuated by hydraulic pressure and two jacks which are set by screws and nuts at a predetermined amount of travel. The wheel and tire are mounted in the carriage on an axle which permits the airplane wheel to roll on its own bearings. Water, either from a built-in tank or a fine spray is used as a coolant to prolong the life of the tire. Load on the wheel and tire, corresponding to the load imposed on one main wheel of the airplane, can be run up to 70,000 lb. The control panel from which all operations are directed has suitable pressure gages, an emergency switch, revolution counters and a hand wheel controlling the amount of hydraulic pressure exerted against the flywheel.

Douglas Rowboat

Although one of the few aircraft manufacturers with no reason to enter the consumer goods market, Douglas Aircraft Co. has marketed an aluminum rowboat. The design weighs only 70 lbs, is 10 ft long and carries six adults. Flotation tanks render it unsinkable.

Operational Speeds and Records

This chart shows the pattern of advance in speeds of air and surface vehicles since 1900. Data for it were compiled by E. H. Heinemann, chief engineer of Douglas Aircraft company's El Segundo plant.

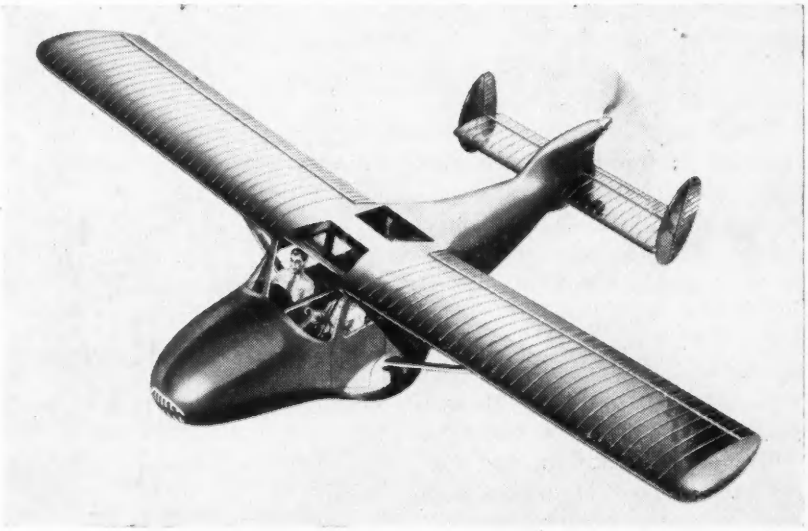


Waco Aristocraft

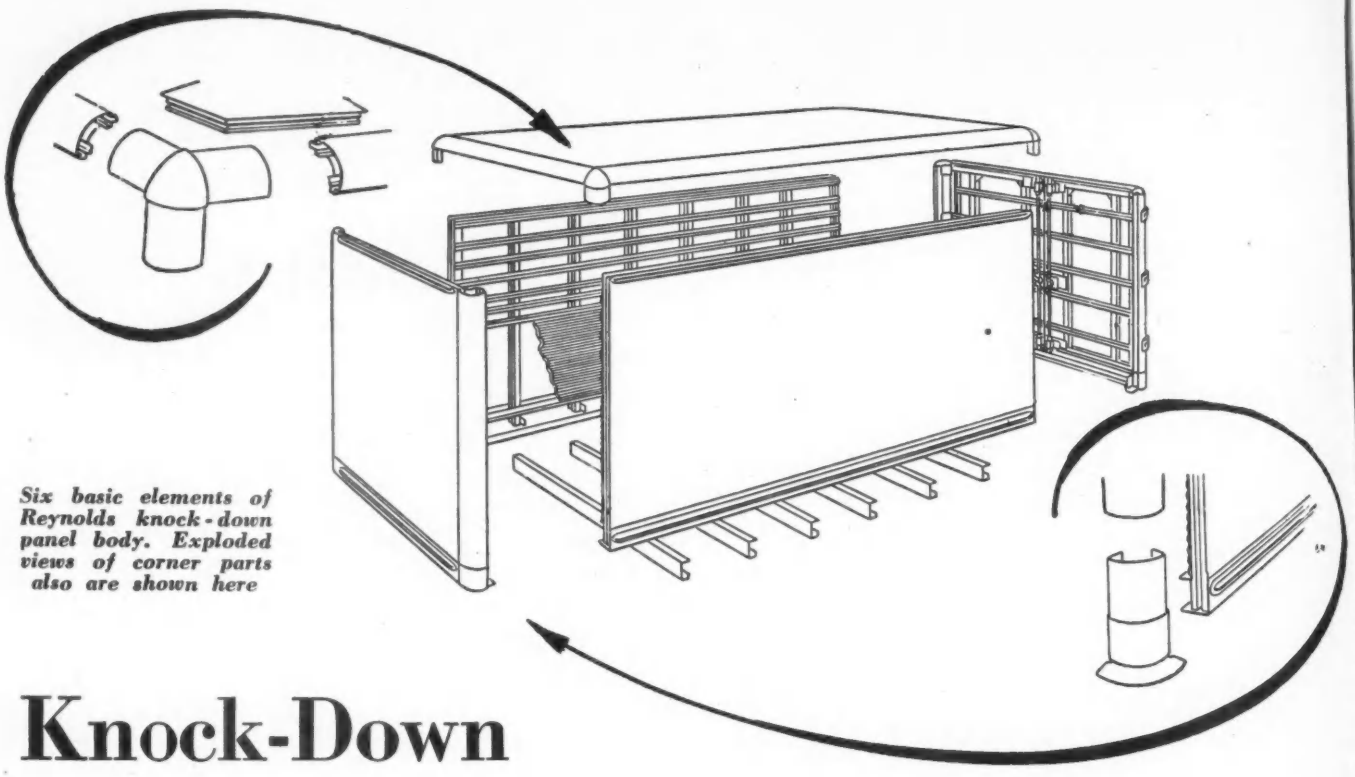
THE WACO AIRCRAFT CO. has announced its silver anniversary model—the Aristocraft, a four-place, high wing, non-spinning pusher-type monoplane with all controls coordinated into one control. The wings, ailerons, horizontal stabilizer, rudder and fins are all metal. The fuselage is tubular steel construction, fabric covered. The Aristocraft engine, a 215-hp six cylinder opposed Franklin air-cooled model, is mounted in the nose section and through an extended drive shaft powers an 84 in. diameter propeller aft of the tail surfaces. The propeller is a Hartzell controllable pitch reversible type. The drive system incorporates Bendix-Weiss constant velocity universal joints with pressure lubricated housings. The retractable landing gear is Firestone make. Specifications of the Aristocraft are given in the accompanying table.

Specifications

Weights:	
Normal gross weight	3000 lb
Weight empty	2046 lb
Normal disposable weight	954 lb
Maximum gross weight	3130 lb
Maximum disposable weight	1084 lb
Dimensions:	
Span, overall	38 ft
Length, overall	25.7 ft
Height, overall	7.7 ft
Areas:	
Wing area (gross)	196.64 sq ft
Aileron area	42.06 sq ft
Horizontal tail area (gross)	38.41 sq ft
Stabilizer area	22.0 sq ft
Elevator area	16.41 sq ft
Rudder area (2)	7.5 sq ft
Fin area (2)	7.2 sq ft
Loadings:	
Wing loading	15.25 psf
Power loading	13.95 psf
Performance Data:	
Top speed, sea level	154 mph
Cruise, sea level	135 mph
Cruise, at 5000 ft	152 mph
Landing and take-off speed	65 mph
Stalling speed	55 mph
Maximum rate of climb at sea level	950 fpm
Service ceiling	17,500 ft
Maximum range with 60 gal of gas	605 miles, sea level 657 miles, 5000 ft



Waco Aristocraft four-place model



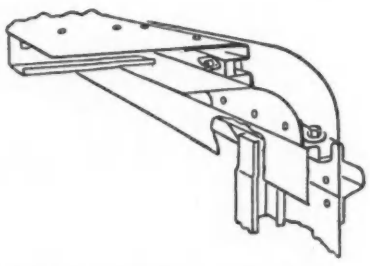
Six basic elements of Reynolds knock-down panel body. Exploded views of corner parts also are shown here

Knock-Down All-Aluminum Bodies

Developed by Reynolds for Trucks

As AN important part of a postwar program for widening the uses of aluminum, the Reynolds Metals Co., Louisville, Ky., has developed a line of truck all-aluminum bodies fabricated from standard panels and hardware parts, and shipped "knock-down" to distributors in various parts of the U. S. A. They can be erected with the expenditure of around 20 man-hours time to suit the specifications of fleet operators. The exploded view of the standard truck body, as illustrated, shows the basic scheme of design applicable to all body models. A body consists of six basic elements —the roof, side panels, front panel, back end unit with doors, and floor cross members.

With the establishment of mechanized production lines last month, Reynolds now is producing a straight side model, with deep-wheel-well models to be available in the near future. The bodies are produced in seven standard lengths—8 ft. 8 in., 10 ft. 7 in., 12 ft. 7 in., 14 ft. 6 in., 16 ft. 6 in., 18 ft. 5 in., and 20 ft. 4 in. In addition, there are two standard heights—6 ft. and 6 ft. 6 in.; and three standard widths—7 ft., 7 ft. 6 in., and 8 ft. Although the cost of an all-aluminum body runs higher than that of standard steel bodies, the former offers considerable weight saving with a consequent increase in payload for the same chassis.



Radius sections are joined to roof and sides by lock bolts and nuts

Body sections are being produced in a new mechanized plant provided with massive framing jigs which assure full interchangeability of sections. The aluminum sheet, rolled in Louisville, is cut to size and ready for assembly. Similarly, the rounded corner sections are made up in fast form rolling mills right in the manufacturing department and cut to proper length for each job. Hinges and certain other parts are made of sand-cast aluminum. In the assembly of each section, the skin and other members are joined mostly with duPont explosive rivets. Assembly of the body in the plant of the fabricator requires the installation of a small number of bolts which are screwed directly into Elastic Stop-Nut fastenings permanently positioned and riveted in place at assembly in the Reynolds plant. Being made up in the metal framing jigs, these fastenings line up perfectly and permit easy bolting-up of side panels to the front panel, the back end and the roof.

In the near future Reynolds also will produce trailer bodies which differ from the truck

(*Turn to page* 77, *please*)

NEWS *of the* Industry

September Developments Indicate that Industry is Still Beset by Many Troubles . . . Shortages of Materials to have Long-Time Effect on Production . . . Ford and Chevrolet Light Car Projects Temporarily Abandoned . . . Sufficient Lead in Sight to Keep Automotive Plants Running . . . Wage Debacle May Prove Costly to Automobile Industry . . . Low Production Chief Factor in Ford Price Increases . . . Worker Efficiency Below 1941 Level.

Several significant developments during September show clearly that the automotive industry still is wallowing in a sea of troubles. General Motors president, C. E. Wilson, reported that basic materials now are looming as the most serious barrier to continued production. He said that the Corporation should have a price increase of around $100 a car for a satisfactory return at present levels of production. Hudson, Chrysler, Nash, and Timken Axle lost considerable production because of wildcat strikes. Foremen at five Chrysler plants voted in an NLRB election to join the Foremen's Assn. of America. Production performance indicated that once again the industry would fall short of anticipated schedules for the month. And both Ford and Chevrolet announced that they had deferred indefinitely their light car programs.

All these developments are on the debit side of the ledger. They are the outward manifestations of the confusion, dislocation, and general trouble bedeviling the industry today. And while total output in September undoubtedly will pass that of August, the gain is not big enough to warrant any particular optimism. The chronic falling behind projected schedules each succeeding month speaks for itself. That is why leading men in the industry say that it will be many months before peak production is attained.

Raw Materials Present Long-Range Problems

For the past few months, it has been supplier strikes that have been holding the industry down to low volume production. Although the strikes still are going on, they have been superseded as the major problem by the increasingly critical situation in raw materials, such as lead, steel, pig iron, copper, and even such items as castor oil for brake fluid. Right now, lead appears to be the most critical item, but steel probably is the material that will have a long-time effect on production schedules. According to current prospects, there will not be enough steel available all next year to make possible the six million car year the industry has set for its goal. At present, steel mills are humming along at near capacity, but the demand is so great that the amount allocated for automobiles and trucks will supply enough for only a moderate increase over 1941 levels at best, according to steel industry spokesmen. One thing that has delayed the expansion of the steel industry was the prolonged strike in the electrical industry, with the result that machinery promised for this fall may not be delivered before late 1947. Priority ratings on steel for certain uses, such as housing, agricultural implements, and food packing, also make it difficult for automotive manufacturers to get their current quotas of available steel. One company received only 70 per cent of its 1941 supply in August and is operating on an inventory of only 15 days supply, compared with a normal backlog of 45 days. Some companies are predicting that they soon may have to use steel the day it arrives at the plant.

Ford and Chevrolet Defer Lightweight Car Programs

Another indication that the automotive industry is looking for a tight materials situation for more than a year ahead is the announcements by both Ford and General Motors that they have abondoned for the time being, at least, their plans to build a lower priced lightweight automobile sometime next year. While the uncertain materials situation probably had a great deal to do with the decision, there undoubtedly are other factors involved. Construction difficulties at present are particularly bad, and although Chevrolet had obtained permission to proceed with construction of a new plant near Cleveland, procurement of materials would be extremely difficult. Also, present construction costs are unconscionably high. At any rate construction of the new plant has been halted. Another angle of conjecture is that the companies may have found that they simply cannot build a car of the kind that would appeal to the public at enough of a cost differential to make it practical. Even at present high prices, backlog orders appear to indicate a market for current models that will not be satisfied for a long period, and as long as there probably would not be enough materials to build both current and lightweight models in volume, there would be little point to diverting materials into a cheaper car. Neither company has indicated that the project has been abandoned permanently, but developments in the fields of costs, prices, and market demand undoubtedly will influence any future decision on if and when it again will be taken up.

Government Promises Adequate Lead to Maintain Car Output

Following a strong letter from George W. Mason, president of AMA, John W. Steelman, reconversion director, assured the automotive industry that enough lead would be made available to keep automotive plants running. Mason had reported that unless action on lead was forthcoming, many plants might have to close down in a few weeks. His warning joined that of C. E. Wilson, who told government officials that if the situation did not improve, G.M. would have to lay off some of its employees in October. He said that restricted supplies of lead and copper may prevent the industry from attaining even the limited levels of production attainable within the short steel supply, and asked that at least 75 per cent of the tonnage used prewar by the industry be allotted to maintain production and employment.

Automobile Industry May Feel Affect of Wage Debacle

The recent fiasco which knocked the underpinning from under the government's wage stabilization structure in the maritime strike may yet prove costly to the automobile industry. The debacle proved to the unions once again the impotence and frustration of the Federal government when faced with a determined union drive to break through wage ceilings. It is certain that the success of the strike has been well observed and duly noted at UAW-CIO headquarters in Detroit.

(*Turn to page 54, please*)

Publications Available

Publications listed in this department are obtainable by subscribers through the Editorial Department of Automotive *and* Aviation Industries. In making requests give title above the item concerning the publication desired, the date of issue in which it appeared, your name and address, company connection and title.

Abrasive Wheels

Norton Co.—108-page manual. Covers all abrasives and grinding wheels. Has five chapters, with reference tables and detailed recommendation on the proper selection of wheels for different types of work.

Diesel Lubrication

Sun Oil Co.—Large, profusely illustrated manual dealing with the history and fundamental design of Diesel engines. Especial emphasis is given to Diesel engine lubrication, and a chart on Diesel engine trouble-shooting is included.

Shakeproof Lock Washers

Shakeproof, Inc.—Illustrated folder giving typical applications of Shakeproof Sems Lock washers.

Hydraulic Brakes

Wagner Electric Corp.—This service manual includes general instructions and maintenance suggestions for the new Wagner Lockheed self-adjusting hydraulic brake. Covers operating principles as well as service instructions. Known as Bulletin HU-277.

Non-Metallic Basic Materials

Continental-Diamond Fibre Co.—Bulletin GF-2 gives the electrical and mechanical properties of six non-metallic basic materials, including Diamond vulcanized fibre; Dilecto, a laminated thermosetting plastic; Vulcoid, a C-D dilectric material; Celoron, a fabric-base molded plastic; Micabond, mica in most usable form; and Dilectene, u-h-f insulation.

Hydraulic Power Units

Hydraulic Machinery, Inc.—A 10-page brochure discussing the application of Hymac hydraulic power units. Applications include grinding, milling, boring, drilling, pressing, piercing, riveting, etc.

Silicone Fluids

Dow Corning Corp.—This pamphlet describes in detail two new silicone fluids, DC 702 and DC 703, which are designed for use in high vacuum diffusion pumps. Silicone DC 703 has created a vacuum of less than 5 x 10-8. Physical properties of these silicones are given in detail.

Diesel Engines

Worthington Pump and Machinery Corp.—36-page manual giving detailed description of the type DH Worthington Diesel engine. Profusely illustrated. Detailed specifications.

Wire Rope

Preformed Wire Rope Information Bureau—This 24-page illustrated manual, in addition to giving the applications of preformed wire rope, gives details of its construction.

Drills

Clark Equipment Co.—The care and operation of Celfor drills, together with engineering data, is given in this 24-page booklet. Technical details as an aid to selecting proper tools are presented.

Hydraulic Pipe Bender

Watson-Stillman Co.—Detailed procedure on how to operate this hydraulic pipe bender is given in this eight-page bulletin. Profusely illustrated. Prices listed.

Colloidal Graphite

Acheson Colloids Corp.—A new technical booklet on colloidal graphite in 16 pages, including detailed specification tables regarding dispersions in water, oil, hydrocarbons, alcohol, and special organics. Over 25 illustrations of applications. Photomicrographs of the material.

Cellulose Acetate Butyrate

Tennessee Eastman Corp.—Four-page folder dealing with the preparation of Eastman cellulose acetate butyrate as a dip. The effectiveness of the protective qualities of such strip coatings is discussed, and prices are included.

C. E. Frudden Nominated as SAE President

C. E. Frudden, consulting engineer of the Allis-Chalmers Mfg. Co., Tractor Division, became the sole nominee for the 1947 national presidency of the Society of Automotive Engineers according to G. W. Curtis, general chairman of the society's eleventh annual tractor meeting recently concluded in Milwaukee. The nomination is tantamount to election.

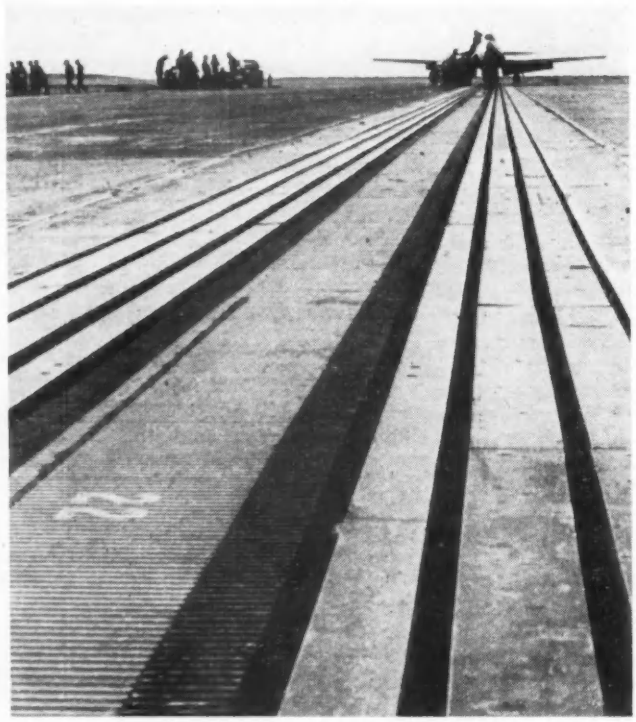
Mr. Frudden will be the first Wisconsin man and the first tractor man elected to the presidency of the 40-year-old society. He will take office at the end of January and begin administering the affairs of the SAE.

Mr. Frudden has a long background of engineering experience. He took his engineering degree from Iowa State College and did graduate work at Columbia. He has submitted research papers to the SAE and the American Society of Agricultural Engineers.

He joined the Allis-Chalmers tractor organization in 1929, where he has been instrumental in effecting many of the advances apparent in the tractor field during the past 17 years. Shortly before the war he was promoted from chief engineer of the West Allis Tractor Division to executive engineer of the entire Allis-Chalmers Tractor Division.

Foremen at Chrysler Vote in Favor of FAA

Foremen in five Chrysler Corp. plants voted Sept. 10 in favor of the Foremen's Assn. of America as their bargaining unit. The vote was 771 for the FAA and 417 against. The corporation has withheld official comment on whether it will proceed to bargain with the foremen or follow the lead of Packard and wait for a decision on the issue in the courts.



Westinghouse Electropult

This electrical device assists planes in taking off from shipboard or small landing fields. It is essentially a huge electric motor laid out flat. The 1382-ft track corresponds to the rotor of a conventional machine and the small shuttle car which runs along it acts as the stator. In operation, a plane is hitched to the car which speeds down the track and tows the plane into the air.

PERSONALS

Recent Personnel Changes and Appointments at the Plants of Automotive and Aviation Manufacturers and Their Suppliers.

Ford Motor Co.—**Harold T. Youngren,** Director of Engineering; **Henry M. Cunningham,** Lincoln-Mercury Manager, Wash., D. C.; **John Francis Connors,** Washington District Manager; **Lewis D. Crusoe,** Director, Planning and Control Division; **R. I. Roberge,** Director, International Division.

General Motors Corp.—**Thomas P. Archer,** Group Executive in charge of Divisions consisting of Fisher Body, Ternstedt, Buick Olds-Pontiac Assembly; **L. C. Goad,** General Manager of Fisher Body Division, including Ternstedt; **B. D. Kunkle,** in charge of Dayton and Household Appliance Divisions; **C. B. Stiffler,** assistant to B. D. Kunkle.

Nash-Kelvinator Corp.—**O. L. Arnold,** President, Nash-Detroit Co.

Timken Roller Bearing Co.—**H. R. McLaren,** Asst. General Supt.; **J. P. Wargo,** Supt. of Tube Mills; **R. R. Elsasser,** Asst. Supt. of Tube Mills.

Packard Motor Car Co.—**James D. Platt,** New York Zone Manager; **M. J. Heiler,** Asst. New York Zone Manager.

Hudson Motor Car Co.—**K. M. Hodges,** Regional Service Supervisor with headquarters at Peoria, Ill.; **C. G. Murphy,** Parts Merchandiser in Los Angeles; **C. L. Henson,** District Manager in Los Angeles.

Willys-Overland Motors, Inc.—**William J. Wade,** Head of the Distribution Planning Group.

Dow Chemical Co.—**Howard P. Atkin,** Member of the Cathodic Protection Sales staff at Los Angeles; **Ray H. McLeod,** Member of the Cathodic Protection Sales staff at Chicago; **John W. Mighton,** Member of the Magnesium Sales staff.

United States Rubber Co.—**Leonard E. Luse,** promoted to newly created post of Manager of Distribution Planning and Business Development; **Frank W. Lewis,** Merchandise Manager, allied products; **John T. Griffith,** Manager, sales operations.

Sun Oil Co.—**Dr. Eugene B. Nugent,** Manager of a new Automotive Sales Engineering Division in Philadelphia.

Stewart-Warner Corp.—**Hunt Eldridge,** head of the National Accounts Department, Alemite Division.

Perfect Circle Co.—**Daniel C. Teetor,** Acting Vice-President in Charge of Engineering.

National Malleable and Steel Castings Co.—**Cleve H. Pomeroy,** elected President.

King-Seeley Corp.—**Halstead H. Seeley,** appointed Director.

International Nickel Co.—**J. E. Fifield,** member of the Development and Research Division; **E. A. Tice,** member of the Corrosion Engineering Section of the Development and Research Division.

Joseph T. Ryerson & Son, Inc.—**T. L. Kishbaugh,** member of the staff of new Los Angeles plant.

Aitkin-Kynett Co.—**D. E. Sturm,** Asst. Treasurer.

Goodyear Tire & Rubber Co.—**Dr. Jerome C. Hunsaker,** elected member of the Board of Directors; **Harry A. Walker,** Plant Engineer at Lecheria, Mexico.

B. F. Goodrich Co.—**D. D. Reichow,** Asst. to the Vice-President, Employe Relations; **J. R. Thompson,** District Manager, Denver, Col.; **C. H. Hedenberg,** Operations Manager, Goodrich Svenska Gummi, Aktiebolag, Sweden; **Clyde O. DeLong,** Merchandise Manager of Industrial Products Sales Division.

Fairchild Engine and Airplane Corp.—**Kenneth P. Bowen,** Asst. General Manager, Aircraft Division.

Consolidated Vultee Aircraft Corp.—**G. A. Mueller,** Contracts Director.

Allegheny Ludlum Steel Corp.—**W. B. Pierce,** Manager of newly consolidated Sales Development and Engineering Service Divisions.

United Specialties Co.—**David P. Eastman,** Chief Engineer, United Air Cleaner Division.

Northrup Aircraft, Inc.—**Walter W. Barden,** Service Engineer.

Luscombe Airplane Corp.—**James P. Cunningham,** elected to the Board of Directors.

Fafnir Bearing Co.—**Fayette Leister,** Vice-President in Charge of Engineering.

Boeing Airplane and Aircraft Co.—**D. A. Forward,** elected to the Board of Directors.

Ampco Metal, Inc.—**J. Donald Zaiser,** President and General Manager.

Oakite Products, Inc.—**J. C. Leonard,** Sales Manager, Industrial Marketing Division.

Wrought Washer Mfg. Co.—**Lawson Adams,** Secretary and member of the Board of Directors; **Walter F. Borges,** in Charge of Advertising.

Evans Products Co.—**Hazen J. Payette,** Michigan representative for Thermo-Aire Division.

Bowser, Inc.—**J. C. Lungerhausen,** Chief Development Engineer, Industrial Pump Division.

Bendix Test Helicopter

This is a full-scale flying model on which tests are being made in advance of the Bendix four-passenger machine now nearing completion. It carries a pilot only, and is not a prototype of any Bendix helicopter. A 100 hp Continental engine drives the rotors which have a radius of 12½ ft.

Allison to Build J-35 Jet Turbine Engines

Contracts to build the J-35 jet turbine engine for the Army Air Forces have been assigned to Allison Division of General Motors. Already announced as the power plant for Republic Aircraft's new P-84 "Thunderjet," the new engine also is scheduled for installation in new and advanced type AAF airplanes for which details have not been released.

To date built-in limited quantities by the Chevrolet Motor Division of General Motors at Tonawanda, N. Y., all production will be transferred as quickly as possible to the Allison plants in Indianapolis.

For a short interim period parts production will be continued at the Tonawanda plant under Allison management to assure uninterrupted delivery of engines during the transfer of production facilities. However, as fast as a sufficient backlog can be established on individual parts, the production facilities will be dismantled and moved to Indianapolis. It is expected that the Tonawanda plant will be entirely cleared and all facilities relocated in Indianapolis by the end of the year.

The J-35 is the axial type jet engine developed by the General Electric Co., originally known as the TG-180. It differs from the J-33 jet turbine engine in the Lockheed P-80 "Shooting Star" in the manner in which the air is compressed before it enters the combustion chamber. In the J-33, the air is compressed by a single centrifugal type compressor whereas in the J-35 the air is compressed by a series of compressors on a single shaft.

Increased Shipments of Chevrolet Trucks

Shipments of Chevrolet trucks in July and August of this year were greater than in the corresponding months of 1941, according to T. E. Keating, general sales manager. Shipments for the two months totaled 51,257 units, compared with 36,698 in July and August of 1941. Chevrolet now is building a new three-quarter-ton truck with many new features, including a full floating rear axle.

"Better Goods at Lower Prices" Theme of ASTE Semi-Annual Convention

"Better goods at lower prices while paying higher wages" was announced as the theme of the Semi-Annual Convention of the American Society of Tool Engineers by President A. M. Sargent. He said the Pittsburgh gathering Oct. 10-12 will consider "the major problem facing tool engineers and industry today. Our general program and the technical sessions to be held coincident with the convention are designed to help solve this problem."

An anticipated 2500 engineers from 48 states and Canada, plus foreign representatives, will exchange knowledge accumulated in changing over from war to peace. In turn benefits from these new methods will soon appear in nearly every branch of manufacturing.

The convention program includes seminars on technical subjects, at which engineers will discuss reconversion and other problems and exchange knowledge. They will visit industrial plants in the Pittsburgh area to study production techniques.

There will be a two and one-half hour "know-how" session each morning, accompanied by "how-to-do-it" movies. The engineering films to be shown include a number made for the armed forces and not shown to the public previously.

Discussion of technical subjects will open Thursday afternoon, Oct. 10.

Stephen Urgan of Pratt and Whitney, Syracuse, N. Y., will reside over a meeting devoted to "Welding and Design," followed in the evening by a discussion of "Gas Turbine Tooling and Production," directed by Robert W. Ford of the Ex-Cello Corp., Pittsburgh.

Friday sessions will deal with "Precision Castings," "Tooling with Carbides" and "Manufacturing Analysis." In charge will be H. E. Linsley of *The Iron Age*, New York; E. W. Baumgardner of Industrial Oven Engineering Co., Cleveland; and O. W. Winter of Acme Pattern and Machine Co., Buffalo, N. Y.

On Saturday morning, Fred L. Schmitt of D. A. Stuart Oil Co., Chicago, will conduct the final lectures, dealing with various phases of "Multiform Grinding."

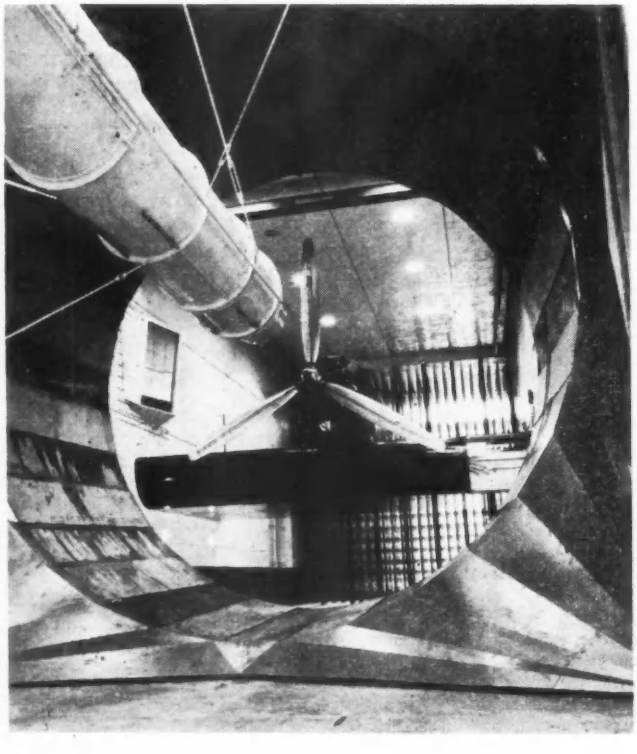
Chevrolet Introduces Line of ¾-Ton Trucks

To round out its line of commercial vehicles, Chevrolet has just introduced a line of ¾-ton, all-purpose trucks available in a wide variety of popular models. The basic 125¼-in. wheelbase chassis is offered as a stripped chassis, chassis and windshield, chassis and cab, and with pick-up, platform and stake bodies. Maximum gross vehicle weight (GVW) is 5800 lb.

From the standpoint of mechanical features the most important is the adoption of a full-floating, hypoid gear rear axle, similar in design to the axle used in the 1½-ton models. It has a ratio of 4.57 to 1 and a load capacity of 5000 lb.

The engine is the standard Chevrolet Thriftmaster and remains unchanged in specifications. Hydraulic service brakes are standard—11 x 1¾ in. at the front, 12 x 2 in. rear. The vehicle is equipped with the standard three-speed transmission but the four-speed truck transmission also will be made available as optional equipment.

Tire equipment comprises single, so-called 15-in. commercial 6-ply tires all around. As optional equipment, Chevrolet will supply the 15-in. commercials in 8-ply; also 17 x 7.00 in. in 6-ply or 8-ply.



Adjustable Funnel in New Test Cell

This test cell at Hamilton Standard Div. of United Aircraft Corp. will accommodate propellers up to 30 ft in diameter. The funnel, or orifice, is constructed of 24 overlapping steel plates 15 ft long and three ft wide, hinged at one end. Power-operated cables move the plates to constrict the opening, and other cables to each of the plates expand it as the wrappers are unwound.

Business in Brief

Written by the Guaranty Trust Co., New York, Exclusively for AUTOMOTIVE *and* AVIATION INDUSTRIES

Moderately reduced levels of general business activity are indicated. The *New York Times* index for the week ended Sept. 7 stands at 132.8, as against 136.2 for the preceding week and 123.4 a year ago.

Sales of department stores during the week ended Sept. 7, as reported by the Federal Reserve Board, equald 264 per cent of the 1935-39 average, as compared with 281 per cent in the week before. Sales were 50 per cent above the corresponding distribution a year earlier, as against a preceding similar excess of 45 per cent. The total in 1946 so far reported is 31 per cent greater than the comparable sum in 1945.

Electric power production was reduced in the week ended Sept. 7. The output was 7.0 per cent above the corresponding amount in 1945, as compared with a like advance of 6.5 per cent shown for the preceding week.

Railway freight loadings during the same period totaled 794,483 cars, 12.5 per cent less than the figure for the week before but 8.9 per cent above the corresponding number last year.

Crude oil production in the week ended Sept. 7 averaged 4,799,950 barrels daily, 33,500 barrels less than the preceding average but 281,550 barrels above the comparable output in 1945.

Production of bituminous coal and lignite during the week ended Aug. 24 is estimated at 12,215,000 net tons, 1.2 per cent above the output in the week before. The total production in 1946 so far reported is 14.0 per cent less than the corresponding quantity in 1945.

Civil engineering construction volume reported for the week ended Sept. 12, according to *Engineering News-Record*, is $86,166,000, slightly more than the preceding weekly figure and 43 per cent above the comparable sum in 1945. The total recorded for thirty-seven weeks of this year is 187 per cent more than the corresponding amount in 1945. The increase in private construction is 423 per cent, and the rise in public construction is 68 per cent.

The wholesale price index of the Bureau of Labor Statistics for the week ended Sept. 7 is 122.0 per cent of the 1926 average, as compared with 128.2 for the preceding week and 105.0 a year ago.

Member bank reserve balances increased $97,000,000 during the week ended Sept. 11. Underlying changes thus reflected include a decrease of $76,000,000 in Reserve bank credit and a decline of $94,000,000 in Treasury deposits with Federal Reserve banks, accompanied by a reduction of $7,000,000 in money in circulation.

Total loans and investments of reporting member banks declined $887,000,000 during the week ended Sept. 4. A rise of $111,000,000 in commercial, industrial and agricultural loans was recorded. The sum of these business loans, $8,607,000,000, shows a net increase of $2,552,000,000 in twelve months.

Weekly Production of Cars and Trucks in U. S. and Canada*

Week ending	1946	Corresponding Week in 1941
Jan. 5	13,920	76,935
12	23,340	115,935
19	28,465	124,025
26	29,410	121,948
Feb. 2	29,295	124,400
9	23,785	127,675
16	21,555	127,510
23	19,410	127,740
Mar. 2	17,575	126,550
9	23,050	125,915
16	35,020	131,410
23	37,285	123,805
30	43,070	124,165
Apr. 6	47,735	116,255
13	49,425	99,260
20	57,565	99,945
27	64,620	108,165
May 4	67,060	130,610
11	71,335	132,380
18	48,565	127,255
25	53,020	133,560
June 1	31,895	106,395
8	43,175	133,645
15	50,206	134,632
22	54,475	133,565
29	60,015	127,926
July 6	45,175	96,457
13	74,015	114,318
20	80,395	109,912
27	84,720	105,635
Aug. 3	79,385	62,146
10	77,825	41,795
17	88,990	45,550
24	91,360	45,525
31	74,960	39,965
Sept. 7	72,535	32,940
14	88,888	53,165
21	81,162	60,615
Total	1,945,701	3,921,959

Aircraft Division of Willys-Overland Moved

The Aircraft Research and Development Division of Willys-Overland Motors, Inc., has been moved from Toledo to Maywood, Cal. Dr. Norton B. Moore, former manager of research for the Aerojet Engineering Corp. has been appointed director of engineering for the division.

The division will undertake studies of confidential research projects for the Bureau of Aeronautics of the Navy Department.

Joe H. Talley remains as general manager of the division and the entire project will operate under the control of George D. Pence, assistant to the president of Willys-Overland.

Lincoln, Mercury and Ford Prices Increased

Issuance of a revised hardship formula providing temporary price adjustments on new passenger cars and an increase in the maximum retail prices of Ford, Mercury and Lincoln passenger automobiles averaging about 6 per cent were announced Sept. 16 by the Office of Price Administration. The higher prices on cars made by Ford will remain in effect only until March 15, 1947, unless extended or modified.

Sample new retail ceiling prices for cars made by the Ford Motor Co. shown below, include the gross percentage peacetime margins for dealers required by the provisions of the Price Control Extension Act of 1946.

Four Door Sedan	Retail List Price Before Adjustment	New Retail List Price
Ford Deluxe	$1068	$1131
Ford Super-Deluxe	1134	1202
Mercury Sedan	1333	1412
Lincoln Sedan	2059	2185

Similar increases are provided for all other models and in some cases optional equipment prices have also been increased. The increases are applicable only to new cars sold by the Ford Motor Co. on or after Sept. 16, 1946.

American Welding Society to Meet in Atlantic City

The twenty-seventh Annual Meeting of the American Welding Society will be held at Atlantic City, N. J., on Nov. 17-22, inclusive. A total of 80 technical papers has been scheduled for presentation at the 24 sessions covering 15 divisions of the welding field.

The papers include 11 papers on welding research, 13 on resistance welding, four on pressure welding, seven on cutting, three on weldability, three on railroad applications, three on electrodes, four on production welding, three on pressure vessels and storage tanks, three on machinery, three on shipbuilding, four on aircraft, three on structural welding, four on hard facing and three on high alloys. In addition, nine papers will be presented covering a variety of subjects such as the arc welding of cast iron with nickel electrodes, flame-hardening and plant maintenance.

The President of the Society, Wendell F. Hess, will preside at the Annual Dinner on Nov. 21 during which the presentation of medals and prizes will be made. Other features of the Meeting will be the Adams Lecture on Monday evening, Nov. 18, to be given by Dr. Hess, Rensselaer Polytechnic Institute; the University Research Conference on Tuesday evening, Nov. 19, and the annual dinner of the Section Officers, followed by session devoted to Section Activities, on Wednesday evening, Nov. 20.

The President's Reception for members and guests of the Society will be held on Sunday evening, Nov. 17, from 5 to 7.

CALENDAR

Conventions and Meetings

SAE Natl. Aeronautic Mtg. & Aircraft Eng. Display, Los Angeles Oct. 3-5
Amer. Management Assoc. Industrial Relations Conf., Boston Oct. 8-9
Amer. Society Tool Engineers, Semi-Annual Convention, Pittsburgh Oct. 10-12
1946 Natl. Aviation Clinic, Oklahoma City Oct. 14-17
SAE Natl. Transportation and Maintenance Meeting, Chicago Oct. 16-17
Armour Research Foundation Conference on Hydraulic Machinery, Chicago ..... Oct. 22-23
Amer. Soc. Body Eng. Technical Meeting, Detroit Oct. 23-25
Natl. Tool & Div. Mfgrs. Assoc. Convention, Chicago Oct. 23-26
SAE Natl. Fuels & Lubricants Mtg., Tulsa Nov. 7-8
American Battery Manufacturers Annual Fall Session, Chicago .... Nov. 7-9
French Aero Show, Grand Palais, Paris Nov. 15-Dec. 1
Natl. Aircraft Show, Cleveland Nov. 15-24
American Welding Society Annual Meeting, Atlantic City Nov. 17-22
Natl. Metal Congress and Exposition Atlantic City Nov. 18-22
American Assoc. Motor Vehicles Adm., Annual Mtg., San Francisco Nov. 18-21
SAE Natl. Air Transport Engineering Mtg., Chicago Dec. 2-4
National Wheel, Rim Assoc., Annual Meeting, Chicago ..... Dec. 4-7
Natl. Standard Parts Assoc. Conv., Atlantic City Dec. 6-7
Motor & Equip. Wholesalers Assoc. Convention, Atlantic City Dec. 6
Automotive Service Industries Show, Atlantic City Dec. 9-14
Society for Experimental Stress Analysis, Annual Mtg., New York Dec. 9-11
Int. Aviation Celebration & Exhibition, El Paso Dec. 12-15
SAE Annual Mtg. & Eng. Display, Detroit Jan. 6-10

Borg-Warner Acquires Propeller Plant

Borg-Warner Corp. has acquired the propeller plant of the A. O. Smith Co. at New Butler, Wis., a suburb of Milwaukee. After new machinery is installed, the plant will be used for manufacture of automatic transmissions.

Destination of U. S. Aircraft Exports January through May, 1946

Country of Destination	Units	Value (thousands)	Shipping Weight (Pounds in thousands)	Units	Value (thousands)	Shipping Weight (Pounds in thousands)
Total	640	$21,869	5,784	694	$4,263	1,139
North America	252	2,784	1,492	215	922	292
Central America	97	949	625	53	306	103
South America	140	3,955	1,754	155	575	216
Europe	69	10,883	1,352	227	1,953	425
Rest of World	82	3,298	561	44	507	103

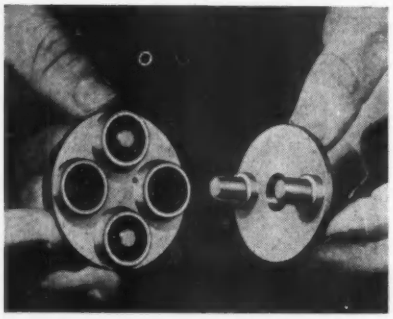
Source: Bureau of Census, Report 410.

New Products

Morflex Couplings in Smaller Sizes

Smaller Morflex couplings, designed for the low-power takeoff of fractional-horsepower drives, are recent additions to the line of power transmission equipment manufactured by Morse Chain Co., 7601 Central Ave., Detroit, Mich.

Available in two new sizes, handling three and nine lb-ft torque, the couplings weigh approximately ½ lb and 1¼ lb, respectively. Maximum rpm is 3600 for both sizes. The choice of stock bores ranges from ¼ in. on the smaller to one in. on the larger.



Morflex couplings

As in its larger couplings, Morse uses the flexible Neoprene biscuit assembly, which shields machine installations from shock and permits slight angular misalignment of shafts while transferring maximum power. The Morflex coupling is unaffected by oil, dirt or weather, and requires no lubrication.

New Abrasive

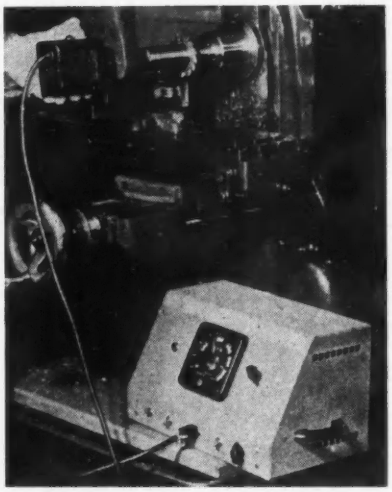
A new aluminum oxide product known as 32 Alundum abrasive has been developed by Norton Co., 1 New Bond St., Worcester, Mass. It is made by a unique electric furnace process which produces grains of an improved shape and structure, each grain being a complete, single crystal. When all other types of aluminum oxide abrasive are produced in the electric furnace the crystals form in a solid mass, the size and shape of each crystal being affected by the adjacent crystals. Thus they bear no relation to the size and shape of the final grains, and a crushing operation is necessary to reduce the abrasives to grains of commercial sizes.

The grains of this new 32 Alundum abrasive, however, form in the electric furnace as single, individual crystals which do not require any crushing to size. Inasmuch as the crystals form individually they assume a chunky, nubbly shape. The many plane surfaces form both exterior and reentrant dihedral angles, the latter making definite rake angles which are said to increase the cutting efficiency of the grains.

Electronic Tachometer

An electronic tachometer designed for measuring rotating speeds from 300 to 50,000 rpm has been announced by the Special Products Division of the General Electric Co. Weighing only 19 lb, the new tachometer is useful for the production testing of equipment instantaneously without the necessity for any permanent attachments. It can be used to indicate the speeds of electric motors, machine tools, automotive and aircraft engines, pumps, fans, blowers and other types of rotating equipment.

The electronic tachometer consists of a small pick-up head, six feet of flexible cable, and a measuring unit with a panel-mounted indicating instrument reading directly in rpm. Either a low-speed or high-speed head can be used with the instrument. The low-speed head provides five speed ranges, 0-1000, 0-2000, 0-5000, 0-10,000 and 0-20,000 rpm, while the high-speed head provides three speed ranges, 0-10,000, 0-20,000 and 0-50,000 rpm.

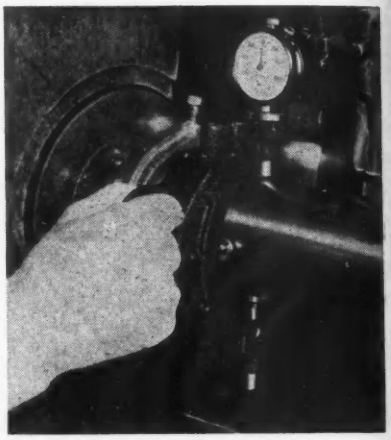


G-E tachometer

Each pick-up head consists of a light-interrupting disk and a phototube. Light shining upon the phototube through the openings in the rotating disk produces input signals which are then transferred to the measuring unit, which indicates the rpm of the equipment being tested. The shaft to which the disk is attached rotates on ball bearings and requires very little torque, and therefore the speed of the equipment being measured is not reduced by use of the tachometer.

Decimatic Dial Snap Gage

Demountable heads and extension spacers are features of the Decimatic dial snap gage recently placed on the market by Standard Gage Co., Poughkeepsie, N. Y. A single pair of heads and four extension spacers of different lengths cover a range of four in.



Decimatic dial snap gage

Using a popular sized Decimatic indicator these instruments are said to show highly consistent repeatability and freedom from whip and waver of the hand. They are easily set to a master. Both of the gaging pins are surfaced with cemented carbide to reduce wear. The lower, adjustable pin is flat, while the upper one, which actuates the indicator, presents a spherical surface. The gage is operated by passing it over the work piece and noting the greatest deflection of the hand as the reading.

The smaller sizes may be used in bench stands as comparators. When the instrument is used in this way, the indicator is reversed to face the operator.

Production Leadchek

A production Leadchek just introduced by the Sheffield Corp. of Dayton, Ohio., has adjustable truncated cylindrical gaging anvils which make possible precision checking of thread lead within a range of 4½ to 60 threads per in. to an accuracy of .0001 in. on production parts such as aircraft components, studs, small shafts and similar units.

The new Sheffield Leadchek may be had with either of two types of gaging heads, one being a "tenth" dial indi-

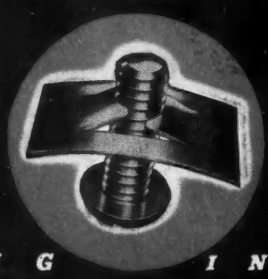
Here's REAL NEWS for everyone concerned with reducing assembly costs.

"C7000" SPEED NUTS cost less than ordinary threaded nuts plus lock washers.

Samples and prices are ready to go-we're waiting for your request.

THESE NEW C7000 self-locking, flat type SPEED NUTS are made in 10 standard sizes for machine screws and sheet metal screws

TINNERMAN PRODUCTS, INC. • 2059 FULTON ROAD • CLEVELAND 13, OHIO



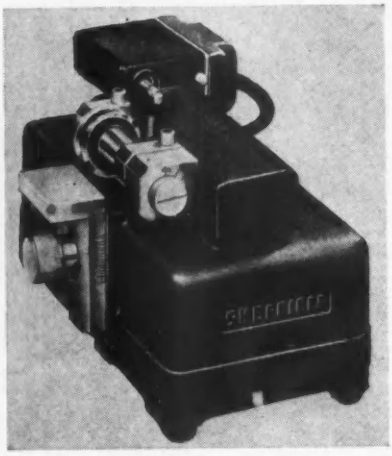
Speed Nuts* PATENTED

*Trade Mark Reg. U. S. Pat. Off.

MORE THAN 3000 SHAPES AND SIZES

FASTEST THING IN FASTENINGS

cator for lead tolerances within the indicator range, or an Electrigage for more accurate gaging where lead tolerances are as narrow as .0001 in. The adjustable truncated cylindrical gaging anvil can be moved and locked in place at any point within a range of .200 in. to 2.000 in. Both gaging anvils are adjustable for the desired pitch by ro-



Sheffield Leadchek

tating on their mounting shafts. Calibrations on the mounting blocks make setting easy.

The inner face of each anvil is held parallel to the center line of the disc, permitting the set-up to be made with gage blocks inserted between the inner faces. For the most accurate checking, setting should be made with a master thread gage. The work table is adjustable as indicated by calibrations on side of table, enabling the checking of parts up to two in. in diameter.

Silicone Paint

A new silicone paint that may afford lifetime finish for motor vehicles is being developed by the General Electric Chemical Department at Schenectady, N. Y.

Company officials stated that progress being made in the development of silicones indicates that within five years, motor vehicles can be finished with a silicone paint that will retain its original color and gloss indefinitely. In addition, it is expected that brighter and more clear colors will be obtained with these materials.

Tests of the paint, still in the developmental stage at General Electric, show that the silicone product is highly resistant to severe weather conditions, chemicals and heat. A three year test of silicone painted panels conducted under most severe weather conditions has left the panels practically unaffected. Tests in which silicone treated panels have been immersed in acid and alkali solutions are said to reveal that the new product will retain all its original characteristics while materials now commonly used would deteriorate.

Precision Balls of Tungsten Carbide

Industrial Tectonics, Ann Arbor, Mich., offers precision balls made of tungsten carbide. They can be furnished in any size, and with any desired degree of dimensional accuracy. Special sizes can be produced in small quantities when required.

Tungsten carbide balls are particularly useful in burnishing and polishing operations, as they will retain their size for a long period of time. Their hardness, in combination with their corrosion resistance, makes tungsten carbide balls valuable for use in check valves, particularly for pumping equipment.

For special applications, such as in the case of tube drawing and bending equipment, tungsten carbide balls can be furnished with holes to permit attachment of wires and cables.

U. S. Rubber Co. Announces Postwar Premium Tire

An automobile tire which utilizes a new principle of increased air capacity at lower air pressure will be produced by United States Rubber Co. as its first postwar premium tire. Known as the "U. S. Royal Air Ride," the new tire will be marketed as a premium tire when government price regulations permit its release.

The new tire combines 14 per cent more air volume and eight per cent

U. S. Royal Air Ride tire

less air pressure. Additional features include a flatter tread and sharply defined shoulders.

The Air Ride tire utilizes the block-tread design, a basic U. S. Royal pattern. The design has been adapted to meet new requirements, such as the virtual elimination of tire noise and the improvement of the car's stopping power.

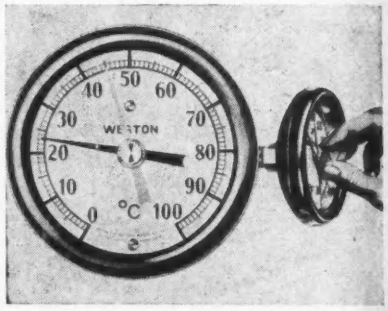
A perforated brake-action tread has been introduced. When the car's brakes are applied, these perforations open up, helping to bring the vehicle to a stop.

The Air Ride tire will be of rayon construction in all sizes authorized by the government. It will be characterized by different size markings, such as "65-16" instead of "6.50x16."

All-Metal Thermometer

An all-metal thermometer, known as the Max-Min, which indicates the maximum or minimum temperatures reached, is now in production at the Weston Electrical Instrument Corp., 614 Frelinghausen Ave., Newark 5, N. J.

Similar in other respects to the standard Weston all-metal thermometer, the Max-Min, has an auxiliary red



Min-Max thermometer

index which is manually set by a finger knob which protrudes from the center of the scale glass.

When a record of the lowest temperature reached is desired, this index is placed to the low side of the temperature pointer. The pointer will move the index to the lowest temperature reached during any operating period, and the index will remain at that low point until manually re-set. For a record of the highest temperature reached, the index is set at the high side of the pointer.

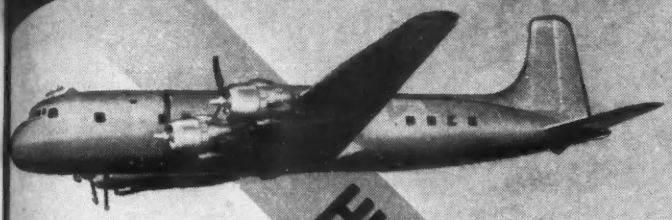
This new Max-Min is available in two models, 221M and 222M, with scale diameters of three and five in. respectively. It is also available in all the usual Weston ranges, and in stem lengths from two and one-half to 48 in.

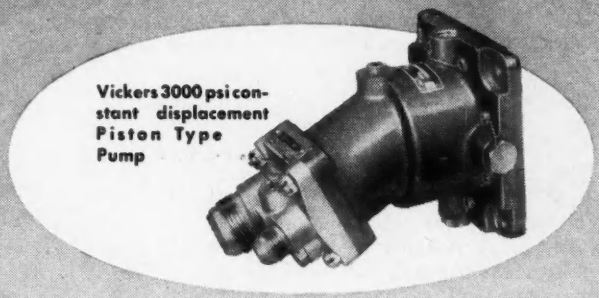
New Process for Finishing Aluminum

The Technical Processes Division of Colonial Alloys Co., Philadelphia 29, Pa., announces the release, to industrial and commercial users, of its process known as Chemoxiding.

All of the aluminums and aluminum alloys can now be processed to produce lustrous glossy finishes which are relatively hard and of excellent corrosion

VICKERS Hydraulic Pumps

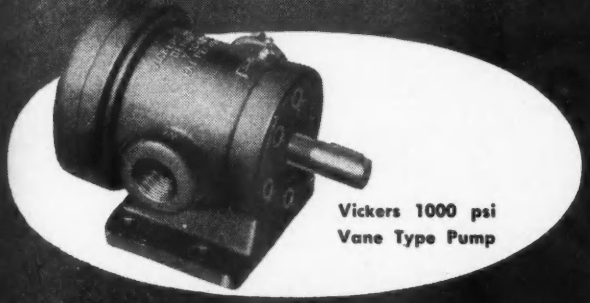




Vickers 3000 psi constant displacement Piston Type Pump

HIGH IN THE SKY to DEEP IN THE EARTH

Reliability with minimum weight . . . greater safety and longer life . . . are among the exacting requirements of the airlines. It is significant to designers and users of many other types of equipment that Vickers Hydraulic Pumps and Controls are widely used in the 3000 psi hydraulic systems of these huge planes that are literally writing new pages in aviation history.



Vickers 1000 psi Vane Type Pump

Huge cutting machines depend upon Vickers Hydraulic Pumps and Controls to speed the work and reduce the cost of mining coal. The operator controls the massive machine more easily than you drive your car.

Between these extremes, Vickers Hydraulic Equipment is serving industry in countless ways . . . wherever accurate, dependable and easy control is needed. In addition to the thousands of more widely known applications on metal working machinery, Vickers Hydraulic Pumps and Controls are used on construction equipment, motor buses, printing presses, agricultural machinery, marine equipment, oil well pumping units, textile and paper machinery, trucks, etc. Vickers Application Engineers will be glad to discuss with you how hydraulics can be used to your advantage.

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

VICKERS Incorporated

Application Engineering Offices: ATLANTA ★ CHICAGO ★ CINCINNATI ★ CLEVELAND ★ DETROIT ★ LOS ANGELES
NEWARK ★ PHILADELPHIA ★ ROCHESTER ★ ROCKFORD ★ SEATTLE ★ TULSA ★ WORCESTER

resistance. No paints, enamels or lacquers are required.

The processing cycle of work includes short time degreasing and cleaning, Chemoxiding and rinsing.

Colorings range from a light gray through marbleized to light brown, depending upon the timing and alloys of aluminum used.

Seiberling Tractor Tire

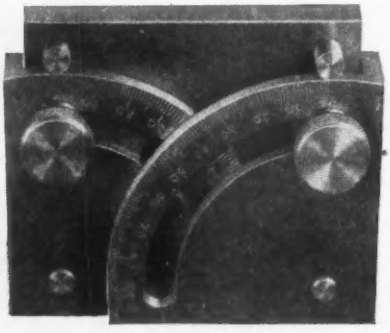
A "plow contour" tractor tire featuring deeper bite, increased traction, and longer wear has been brought out by Seiberling Rubber Co., Akron, Ohio.

The Seiberling "plow contour" tire has an entirely new curved, deep lug tread design that works on newly developed principles of traction. The massive lugs cut through sod, weeds, cover crops, loose soil, or heavy mud until a grip is obtained in solid ground.

Tread design is said to assure better cleaning. Each lug has a contour like the mold-board of a plow which scours and sheds the soil. Open center tread design gives the tire greatest possible flexibility so that it automatically cleans itself with every revolution of the wheel.

Angle Protractor for Carbide Tool Grinders

The new universal angle protractor, designed and manufactured by Willey's Carbide Tool Co., 1340 W. Vernor Highway, Detroit, Mich., can be used on all makes of carbide tool grinders and provides a dual change of angles from 0 to 90 deg. This unique Willey's feature is said to speed up production by permitting the grinding of two tools



Willey's universal angle protractor

simultaneously, at the same or different angles.

Willey's Universal angle protractor, while designed primarily for grinding applications, also lends itself to a variety of operations, such as acting as an angular guide for drilling, grooving and milling.

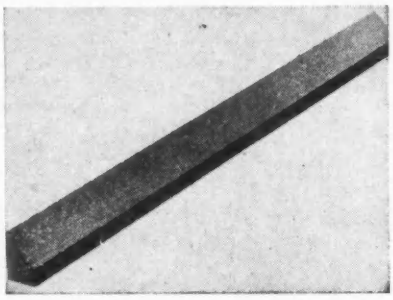
The key is a separate unit which is studded to the body of the adaptor and slides on four steel balls which provide constant thrust and mobility.

Angular Straight Edge

An angular straight edge is a new development of Machine Products Corp., Detroit, Mich.

It is made of heat-treated Meehanite in any size from 18 in. to 84 in. in length with any angle specified. Two faces are hand scraped.

This is said to be the first ready-built angular straight edge ever marketed on a commercial basis. It was designed especially for machine builders and for machine rebuilding or repair work to simplify the task of checking of machine ways and slides. It can be used with or without handles at each end.



Angular straight edge made by Machine Products Corp.

Buda to Resume Production of Diesel Truck Engines

Buda Company will resume manufacture of Diesel truck engines at Harvey, Ill., soon, according to a company announcement. The company discontinued production of Diesel truck engines during the war. Considerable new equipment and machinery have been installed to lower manufacturing costs and to maintain high quality. The company, which has built truck engines since 1924, will build larger engines than it did prewar and will expand its outlets to include foreign markets.

News of the Industry

(*Continued from page* 45)

The opinion among many industry men now is that the chances to stand off wage increases have been irreparably damaged by government's disordered retreat in the maritime strike. Price increases to Ford and probably to other manufacturers also are adding fuel to the fire, so some stormy sessions are in prospect when wage talks open at Chrysler this fall.

Ford Price Increases Reflect Low Production

The increase of approximately six per cent granted to Ford Motor Co. on passenger cars by OPA indicates clearly how the break-even point in the automobile industry has risen from the normal one-third to one-half of capacity, which was considered sound business practice in prewar years, to more than 50 per cent of capacity. At the time the increase was granted, Ford was turning out about 2800 cars a day, which was 50 per cent or more of prewar production. None the less, the company was able to prove conclusively to OPA that it was losing money on each car at that rate of production and that an increase of about 6 per cent was justified. OPA granted the relief under a revised hardship formula. Other companies, including General Motors, have applied for price increases on their cars, and it is indicated in Washington that they will get favorable action.

Labor Productivity Lags Behind Prewar Standards

One factor which has accounted for the need for higher prices to car manufacturers is the continued low production efficiency of employes. General Motors believes it now stands at about 80 per cent of prewar levels. Other companies report that worker efficency is down below the 1941 rate appreciably, but do not give percentage figures. While there has been a general opinion in the industry that individual productive effort will eventually be brought back to normal, some personnel men privately are beginning to doubt seriously that it will be recovered for years, if ever. They say that the output per man will rise, but it will come from technological advancement and not from increased effort by the individual worker. One company says that it is beginning to think that the only avenue to lower production costs is the employment of more automatic and semi--automatic machinery to replace workers who simply refuse to put more effort into their jobs.

White New WB Series

(*Continued from page* 30)

rect either in fourth or fifth gear are available for all models.

Single-reduction spiral bevel gear rear axles are standard throughout the line except on the WB-26 and WB-3264 models, which have double reduction rear axles. Otherwise either double-reduction or two-speed rear axles are offered as optional equipment. Cast malleable iron housings are used exclusively throughout. All models feature increased brake sizes, with Bendix Hydrovac equipment on all models except the WB-2864 and WB-3264 which have air brakes.

Single channel frames are standard on the first eight models including the WB-28T and all frames except the WB-14 are heat treated. The WB-2264-2864-3264 have double-channel frames. In addition, frames for the WB-26-28-28T-2864-3264 are of chrome-nickel alloy steel.

They make the lubricant last longer...

Yes, whatever the load, speed or service requirements of the installation, Torrington Needle Bearings help conserve lubricant... prolong its effective life.

That's because there is an extra margin of lubrication efficiency in Torrington Needle Bearings due to their basic design . . . *the turned-in lips of the hardened retaining shell which provide a natural reservoir for retention of the lubricant.* At the same time this same feature helps to exclude dirt and dust from vital bearing surfaces. The lubricant is kept clean and free from contamination. Consequently, bearing wear is minimized ...less frequent renewal or replacement of the lubricant is required . . . maintenance costs are substantially reduced.

If you are seeking an anti-friction bearing for an application where high capacity, small size and economical cost are important design considerations, Torrington Needle Bearings may be *your* answer! You'll find a wealth of pertinent data in our Catalog No. 32, available on request. If you have a specific application in mind, our engineering department will gladly give you specific recommendations.

THE TORRINGTON COMPANY

TORRINGTON, CONN. • SOUTH BEND 21, IND.

Offices in All Principal Cities

TORRINGTON NEEDLE BEARINGS

Motor Vehicle Factory Sales

From U. S. Plants

Automobile Manufacturers Association, Detroit

1946 Motor Vehicle Factory Sales, by Months, U. S. Plants

1946	Passenger Cars	Trucks	Buses	Total
January	56,367	44,994	467	101,828
February	57,782	34,914	265	92,961
March	85,810	37,636	527	123,973
April	130,816	80,762	948	212,526
May	168,759	75,373	789	244,921
June	141,090	60,038	774	201,902
July	209,180	87,454	862	297,496
August	247,261	97,881	1,067	346,209
Total 8 Mos.	1,097,065	519,052	5,699	1,621,816

Factory Sales to Domestic and Foreign Markets, by Months

1946	Passenger Cars		Trucks		Buses	
	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign
January	53,441	2,926	37,931	7,063	436	31
February	54,109	3,673	26,708	8,206	230	35
March	80,239	5,571	29,095	8,541	443	84
April	124,052	6,764	62,520	19,242	854	94
May	160,059	8,700	59,947	15,426	741	48
June	131,294	9,806	50,247	9,791	751	23
July	195,158	14,022	72,008	15,446	833	29
August	229,083	18,178	78,283	19,598	867	200
Total 8 Mos.	1,027,425	69,640	416,739	102,313	5,155	544

Motor Truck Factory Sales by Gross Vehicle Weight

TOTAL

GVW (lb)	January	February	March	April	May	June	July	August	8 Mos.
5,000 and less	18,535	13,758	16,921	26,925	26,209	32,990	30,617	34,937	200,742
5,001–10,000	3,877	3,100	2,002	5,013	5,933	4,795	7,125	6,744	38,489
10,001–14,000	9,058	9,436	8,451	29,795	22,884	12,754	23,214	28,281	143,873
14,001–16,000	8,499	4,624	7,791	14,969	15,635	5,555	21,572	23,119	101,534
16,001–19,500	1,607	1,151	411	1,711	2,002	1,556	2,247	1,953	12,638
19,501–26,000	2,136	1,760	1,223	1,691	1,729	1,489	1,785	1,958	13,631
Over 26,000	1,282	1,065	937	958	1,081	1,019	914	969	8,245
Total	44,994	34,914	37,636	80,762	75,373	60,038	87,454	97,881	519,052

DOMESTIC MARKET

5,000 and less	17,331	11,822	14,433	23,956	23,122	29,657	26,610	30,210	177,141
5,001–10,000	3,151	2,783	1,719	4,508	5,406	4,396	6,602	6,072	34,637
10,001–14,000	6,713	5,491	5,012	19,098	13,371	8,966	17,196	21,284	95,431
14,001–16,000	6,457	3,156	5,630	11,985	13,819	4,412	17,351	16,841	79,651
16,001–19,500	1,121	869	325	1,519	1,635	1,279	1,808	1,324	9,877
19,501–26,000	1,950	1,569	1,104	1,547	1,576	1,309	1,586	1,627	12,268
Over 26,000	1,208	1,028	872	910	1,008	928	855	925	7,734
Total	37,931	26,708	29,095	62,520	59,947	50,247	72,008	78,283	416,739

FOREIGN MARKETS

5,000 and less	1,204	1,936	2,388	2,969	3,087	3,233	4,007	4,777	23,601
5,001–10,000	726	317	283	505	427	399	523	672	3,852
10,001–14,000	2,345	3,955	3,439	11,697	9,503	4,438	6,013	6,997	48,442
14,001–16,000	2,042	1,468	2,161	2,694	1,816	1,143	4,221	6,343	21,883
16,001–19,500	486	282	86	195	367	277	439	559	2,661
19,501–26,000	186	191	119	144	153	160	179	231	1,363
Over 26,000	74	57	65	43	73	91	59	44	511
Total	7,063	8,206	8,541	18,242	15,426	9,791	15,446	19,598	102,313

Shipments of Complete Aircraft and Other Products of Aircraft Plants—by Months

In Units and Their Value

	January	February	March	April	May	June	July	7 Mos.
Complete Aircraft								
For U. S. Military								
No. of Planes	94	101	135	91	125	60	64	670
Value	$13,541,673	$11,018,956	$15,933,789	$27,520,413	$19,875,535	$11,336,593	$10,314,559	$109,591,518
For Other Than Military								
No. of Planes	1,227	1,252	2,019	2,311	3,073	3,429	3,388	16,699
Value	$7,826,653	$12,427,122	$13,666,253	$17,036,940	$24,143,751	$31,053,777	$10,541,325	$106,700,821
Total—Planes	1,321	1,353	2,154	2,402	3,193	3,489	3,452	17,369
Total—Value	$21,368,326	$23,446,078	$29,600,042	$44,557,353	$44,024,286	$32,440,370	$20,855,884	$216,292,339
Conversions								
No. of Planes	13	30	24	23	31	24	45	190
Value	$1,028,100	$2,420,804	$2,713,920	$3,370,761	$4,997,911	$4,292,356	$4,700,622	$23,529,474
Airframe Spare Parts								
For U. S. Military—Value	$4,015,790	$2,436,303	$2,953,269	$3,144,757	$1,577,843	$2,672,476	$2,258,263	$19,088,706
For Other Than Military—Value	$1,193,826	$1,225,926	$ 878,931	$1,243,943	$1,761,703	$1,928,981	$1,313,371	$9,576,588
Total—Parts Value	$5,214,616	$3,692,229	$3,832,200	$4,388,605	$3,359,551	$4,601,457	$3,576,634	$ 28,665,292
All Other Products								
Modifications—Value	$1,295,945	$1,239,025	$1,534,072	$ 858,914	$ 172,098	$ 411,204	$ 394,403	$ 9,343,179
Aircraft Products—Value					$1,038,841	$ 999,158	$1,399,519	
Non-aircraft Products—Value	$ 758,042	$2,526,066	$2,017,182	$1,379,552	$1,165,776	$2,104,208	$2,275,566	$ 12,226,392

Much Interest in Steam Car Articles

Editor, AUTOMOTIVE *and* AVIATION INDUSTRIES:

The appearance of the series of articles, "Rise and Decline of the Steam Car Industry," in your magazine has brought me a number of communications from readers, which indicates that interest in steam-propelled vehicles is still alive in this country. Some letters came from pioneer owners of steam cars, others from collectors of antique automobiles, and still others from parties who believe that steam power will come back to the automotive industry and play a role in future bus transportation at least.

In the August 15 issue I made the statement that the cranks of the Locomobile two-cylinder engine were set at 180 deg. This was an error to which my attention was called by W. P. Norton, Jr., of the Fellows Gear Shaper Company, whose experience with steam cars dates back to 1899. In two-cylinder steam engines the cranks are always set at 90 deg. to avoid a dead center. There has also been some question as to just when the manufacture of Stanley steam cars ceased. In the first instalment of the series I made the statement that manufacture of steam cars ceased completely in 1923. It would have been better to say that the Stanley company was placed in the hands of a receiver during that year. The receiver, S. L. G. Knox, made efforts to reorganize the company, but in that he did not succeed. Evidently a number of cars were built while he was in charge. During the following year he sold the assets to outside interests, and these are believed to have assembled a number of cars in 1924 and 1925. The fact remains that all attempts to revive the manufacture of the Stanley steamer failed.

One of the most enthusiastic believers in steam power for automotive purposes seems to be William B. McGorum, an engineer with considerable experience in the public service and transit fields who is the author of a recently published article on "Steam as a Post-War Power Possibility." In this article he takes a most optimistic view of the possibilities of steam power in the bus field. He admits that for passenger cars the gasoline engine is the most satisfactory and practical mechanism, but holds that its limitations and weaknesses in heavy-duty applications have cost the business which uses and depends upon vehicles so equipped millions of dollars in wasted resources of materials, labor and manufacturing facilities. I must say that the advantages of steam as a motive power do not seem quite so alluring to me, nor its disadvantages so trivial, as they do to Mr. McGorum, but that may be because I am getting along in years and age naturally damps out enthusiasms and breeds conservatism.

That there is some current activity in the development of steam automotive powerplants is indicated by a letter from Fred M. Young, president of the Young Radiator Co., who writes that his firm is collaborating on the condenser problems of a number of projects now under way.—P. M. HELDT

Spicer Organization Remains Unchanged

While the name of Spicer Manufacturing Corp. was recently changed to Spicer Manufacturing Division of the Dana Corp. there will be no changes of any kind in any phase of the organization and the business will continue to operate exactly as it has in the past according to Charles A. Dane, president.

The statement was issued to clarify the company's position as to how the change of name will affect Spicer policies in personnel, manufacturing and sales.

Name and corporate structure of the Spicer interests were rearranged to eliminate continued confusion of the Spicer name with names of affiliated plants turning out products controlled by Spicer but marketed under their own trade names. These include Parish Frames, Brown-Lipe Gear boxes, Salisbury axles, etc.

Each of the affiliated companies retains its established plant and product names in becoming a division of the newly constituted Dana Corp.

More About Wage Incentives

Editor, AUTOMOTIVE *and* AVIATION INDUSTRIES,

In your August 1 edition there is an article by William R. Donnell under the heading "Wage Incentives the Way Out."

There is much information in there which is scarcely tenable; at least from the experience that we have had on this subject.

The readjustment of rate, the bringing in of outside talent and the relatively small earnings that this shows all would indicate that the conception is not correct.

Incentives should increase output enormously—not a matter of 10 or 20 or 50 pct, but 500 pct or 1000 pct have actually occurred. This is not because of the fact the men just work a little faster, it is because of the fact the men, because of proper incentive, will increase their knowledge and their ideas to the point where tremendous efficiency can be obtained.

It would seem to me that striving for a few per cent, such as is outlined in this article, is far from a proper goal when the enormous increases mentioned above can be obtained.

The incentive system is undoubtedly the way out but like raising a family, it has to be done the right way.

Very truly yours,
J. F. LINCOLN
President

Needs of Trailers and Trucks to Be Studied At SAE Meeting

Progressive improvement in the operation and maintenance of commercial motor vehicles is among multiple objectives of the SAE National Transportation and Maintenance Meeting scheduled for Oct. 16 and 17 at Chicago, Ill. The program provides for engineering symposiums on utilization of the chassis dynamometer in fleet maintenance, space conditioning for motor truck and trailer cargoes, lighter bodies for trucks and trailers, selection and maintenance of tires, and pertinent developments in German automotive equipment.

The meeting will be sponsored by SAE Transportation and Maintenance Engineering Activity, with the cooperation of SAE Chicago Section. The general chairman will be Warren A. Taussig, of Burlington Transportation Co., Galesburg, Ill. The program follows:

WEDNESDAY MORNING, OCT. 16

Chairman E. N. Hatch, New York City Transit System.

Symposium: "The Dynamometer as an Aid in Fleet Maintenance."

Manufacturers: Paul Oberreuter, Mid-West Dynamometer & Engineering Co., Chicago.

Operators: F. C. Patton, Los Angeles Motor Coach Lines, Los Angeles, Calif.

WEDNESDAY AFTERNOON

Chairman E. P. Gohn, The Atlantic Refining Co., Philadelphia, Pa.

Symposium: "Automotive Space Heaters."

"Fresh Air Automotive Heating: Influence of Aviation Industry," by L. A. Rodert, South Wind Div., Stewart Warner Corp., Indianapolis, Ind.

"Automotive Space Conditioning," by E. T. Todd, General Motors Coach Div., Pontiac, Mich.

WEDNESDAY EVENING, Dinner Session

Toastmaster O. A. Brouer, Swift & Co., Chicago.

"Observations of Automotive Equipment in Germany," by Austin M. Wolf, New York.

THURSDAY MORNING, OCT. 17

Chairman, Mr. Taussig.

Symposium: "Light Weight Bodies for Trucks and Trailers."

"Light Weight Bodies of Aluminum for Trucks," by F. O. Lewis, Dayton Power & Light Co., Dayton, Ohio.

"Aluminum and Magnesium in Highway Transportation Bodies," by J. H. Dunn, Aluminum Co. of America, New Kensington, Pa.

"Motor Haulage Bodies of Stainless Steel," by V. M. Drew, Fruehauf Trailer Co., Detroit, Mich.

THURSDAY AFTERNOON

Chairman, D. K. Wilson, New York Power & Light Corp., Albany, N. Y.

Symposium: "Tire Maintenance."

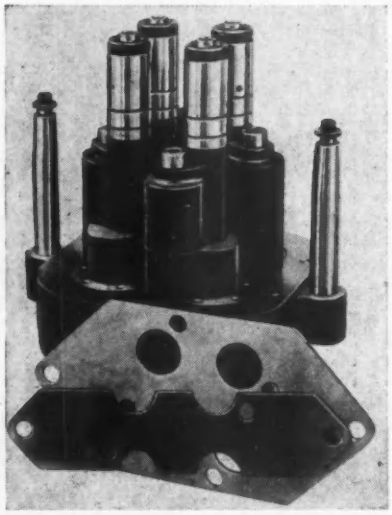
"Present-Day Truck Tire Maintenance," by Ben Sorci, Sorci & Bryant, Chicago.

New Production and Plant Equipment

(*Continued from page* 41)

the hardening caused by welding high carbon material.

THE WISCONSIN quick-change drill head, distributed by Strutz & Mead, Inc., 1225 N. Water St., Milwaukee 2, Wis., is entirely gear driven. Each drill revolves completely around two different centers, each with 15/16-in. radius. This means that each drill point can be located and locked at any point in the area of a 3¾-in. circle. As each circle overlaps at least one other circle, the infinite variety of hole patterns which can be produced is limited only by the number of spindles employed and the combined area of the various spindle circles.



Wisconsin quick-change drill head

Another feature of the Wisconsin quick range drill head is a set of templates furnished for every hole-pattern or bolt-circle which the user may wish to drill. Additional templates for new hole patterns may be obtained.

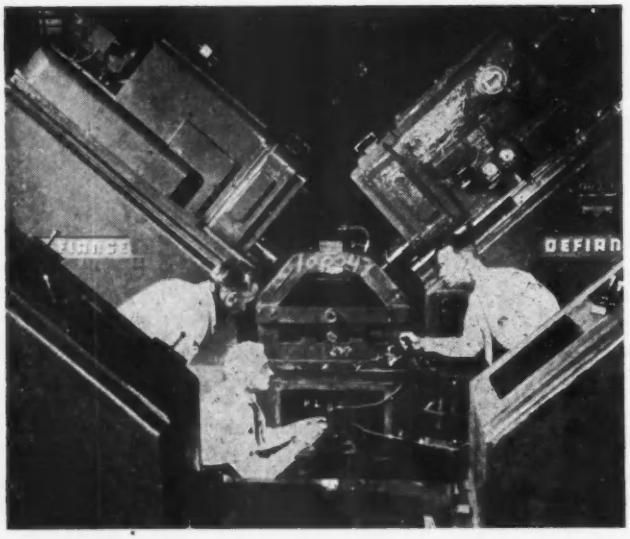
Each set of templates consists of a positioning template and a locking template. The position template has half-holes which permit the spindles to be swung into position quickly and easily. The locking template is then placed over the spindles and bolted to the template support posts, and the individual spindle lock-nuts are tightened. This double locking feature is said to assure rigid and accurate spindle set-ups.

A SERIES of eight machines, designed and built by Defiance Machine Works, Inc., Denance, Ohio, handles production machining of valve holes and inserts in the manufacture of V-type engines.

These machines, which are No. 37 hydraulic units, are mounted in pairs on columns with the proper angle for machining the valve holes. Tunnel-type fixtures are used. The locating pins and clamping arrangements are hydraulically operated and automatically arranged so that the locating pins locate the cylinder block before the clamping action takes place.

The hydraulic units carrying the cluster heads that drive the tools are electrically interlocked so that the operator cannot start the cycle of the machine unless the hydraulic unit for the fixture is running.

The various operations and number of spindles in each machine are as follows: machine No. 1, eight spindles—machines valve chambers and rough cuts the counterbore for inserts; machine No. 2, 16 spindles—rough bores tappet holes and valve guide hole; machine No. 3, 16 spindles—semi-finishes valve guide and tappet holes; machine No. 4, 16 spindles—machines valve clearance and semi-finishes insert counterbore diameter; machine No. 5, 16 spindles—fly cuts valve guide and tappet holes; machine No. 6, 16 spindles—line reams insert counterbore, valve guide and tappet holes; machine No. 7, 16 spindles— rough cuts valve seats of inserts; and machine No. 8, 16 spindles —finish cuts valve seats of inserts.



Defiance machine for machining valve holes in V-type engines

THE THER-MONIC M-285C electronic heating generator, a single, dual-purpose unit, suitable for both induction (metal) and dielectric (non-metal) heating operations, is one of the recent developments of the Induction Heating Corp., 389 Lafayette St., New York 3, N. Y.

Especially designed for use in experimental laboratories, testing depots and development research departments, this combination induction and dielectric heating generator is provided with two separate, interchangeable oscillator sections, one for induction and the other for dielectric heating.

Ther-Monic electronic heating generator

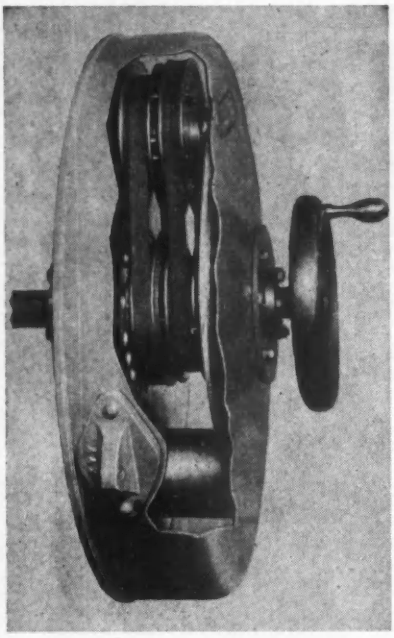
A NEW development of planetary motion in which two standard cross-section V-belts and four variable pitch pulleys provide infinite ratio, stepless speed from full down through zero and into full reverse at constant torque of two hp capacity is jointly announced by Speed Selector, Inc., Cleveland, and the B. F. Goodrich Co., Akron, Ohio.

The Cleveland company designed and developed the new V-belt control, known as the Variable-V-Planetary Speed Selector, while B. F. Goodrich will merchandise the product along with its transmission lines.

A slight change in the variable pitch pulleys of the Speed Selector brings a large change in output speed through the multiplying action of the planetary mounted on the motor or driven shaft of the machine on which it is used, eliminating need for special mounting brackets, or extra guards.

In operation the Variable-V-Planetary Speed Selector system compares the ratios of two V-belt drives and applies the difference in speed to output shafts. With the ratios equal the difference in speed and output shaft speed is zero. If the ratio of one drive is

greater than the other the output shaft rotates forward at a speed proportionate to the difference in ratios. If the ratio is less the output shaft operates in reverse in the same proportionate ratios. Speeds from 400 rpm to zero,



Variable-V-Planetary Speed Selector

forward and reverse can be obtained.

All changes are made by a hand control wheel, which alters the pitch diameter of the center pulleys so that as one is increased the other is decreased and the change imparted to the outer pulleys by the wedging action of the V-belts. It is mounted on the input shaft of the driven machine by a tapered collet. The wheel thus controls diameter of all four pulleys without use of springs or complex linkages.

Frame construction of the Variable-V-Planetary is of lightweight aluminum with cast iron sheaves. Prelubricated, plastic seal, ball-type bearings eliminate dirt and lubrication problems. Shafts and other wearing parts are hardened and ground. Natural ventilation is created by the revolving assembly inside the aluminum housing. The complete speed range is covered by four and one-half turns of the control wheel, with remote controls available.

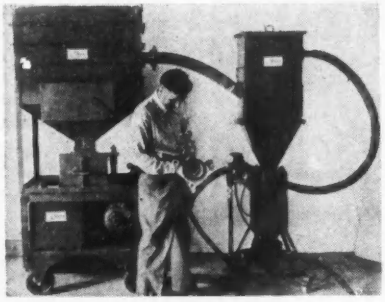
THE VACU-BLASTER, an entirely new blast-cleaning device for cleaning or refinishing metal, concrete, or other hard surfaces, is now in production by the Vacu-Blast Co., Inc., 1054 Broadway, Burlingame, Cal.

The principal feature of the Vacu-Blaster is its vacuum return system which permits no abrasives or other particles to escape into the open. Operated in much the same fashion as a household vacuum cleaner, the Vacu-Blaster may be used without special precautions or preparations. No masks, goggles or protective clothing are needed. There need be no interruption of other operations in the immediate vicinity.

Many types of abrasives may be used, depending upon the nature of the work to be done and the finish desired. Spent abrasive is reclaimed by the Vacu-Blaster and reused as long as it remains effective.

Operation of a Vacu-Blaster is automatic. The blast is controlled by a switch at the gun through which the abrasive blast is directed and through which grit and dust are picked up. The vacuum system operates continuously returning grit and refuse to the reclaiming tank, where reusable grit is returned to the blasting system while dust and refuse are shunted off to a dust collector.

Reclaimed abrasive is automatically dumped into the grit-supply tank at the close of each operating cycle. At the same time, the blasting assembly is automatically flushed with clean air to prevent possible clogging. Loading of fresh abrasive into the Vacu-Blaster is



Vacu-Blaster

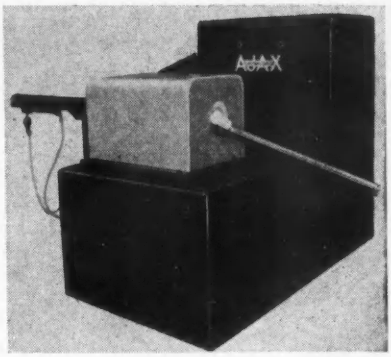
accomplished by the vacuum system, which picks up the grit through the blasting gun from a container on the floor.

DESIGNED for continuous, automatic heating of steel slugs or forging blanks prior to forging operations, a new Ajax-Northrup induction heater that ejects a white-hot slug at just the right temperature, every few seconds, has just been announced by Ajax Electrothermic Corp., Trenton 5, N. J. The unit features an automatically timed feeding device.

The cold slugs are loaded into a roller-type chute on the left side of the heater, are fed in a continuous succession through the horizontal heating coil by a pneumatic ram, and drop out at the other end of the coil into a chute or tongs, ready to be placed in the forging dies.

Production rate with slugs 3⅜ in. dia by 1¾ in. long, for instance, is 350 per hour each slug uniformly heated to about 2200 F. Power source is a 200 kw motor-generator set, operating at about 1000 cycles per second.

The new Ajax-Northrup heater can

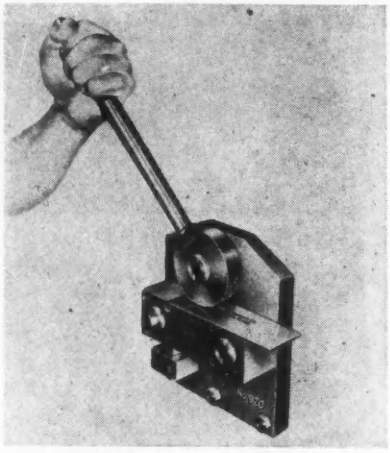


Ajax-Northrup induction heater

be converted from one job to another by changing the heating coil proper, resetting the timing device and adjusting the feeding chute. Since the heating coil is only a relatively small part of the total cost, a number of different sizes can be supplied economically.

THE ACROMARK CO., 303 Morrell St., Elizabeth, N. J., is making a machine for marking flat parts. With slight changes, it will also mark round parts. The machine is constructed from a heavy gray iron casting having a steel stud at the top to carry a sleeve bearing mounted rolled marking die. In the die is a handle hole to accommodate the handle for rolling the mark into the flat part which passes over a double row precision ball bearing held in the adjustable arm.

The arm is hinged by a shaft through the frame at one end and at

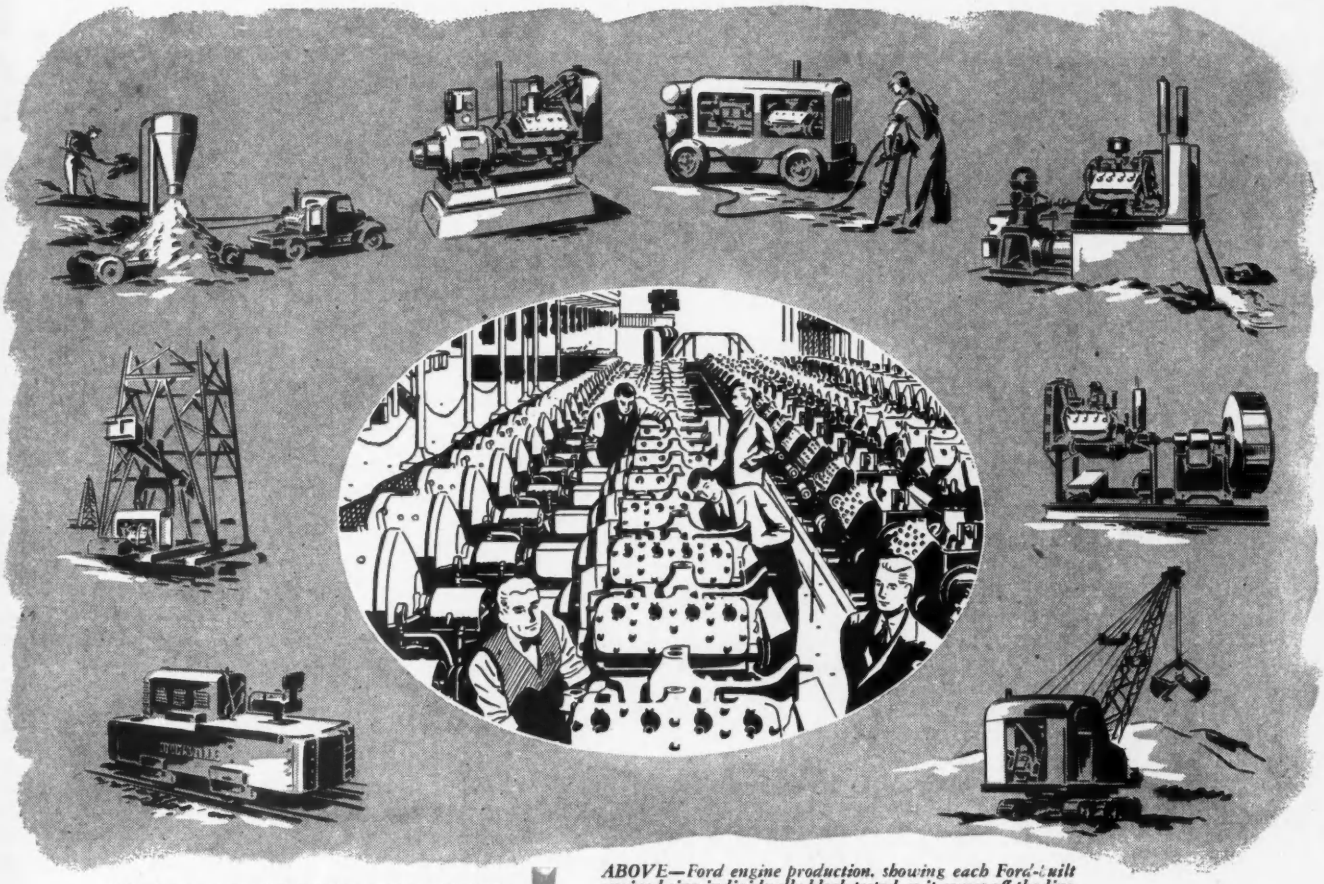


Acromark marking machine

the other end it is bolted to the frame through an elongated hole or slot permitting adjustment. Working adjustment is obtained by means of a screw and lock-nut, set beneath the locking bolt end of the arm.

Four lines of a company name and address can be sunk into unhardened steel, stainless steel or other material, and the part moves freely through the marking process because the pressure is taken by the free-rolling bearings.

FORD-BUILT ENGINES



ABOVE—Ford engine production, showing each Ford-built engine being individually block-tested as it comes off the line.

PREFERRED! for the way they're BUILT . . . and the way they're SERVICED!

The world-wide demand for Ford-built engines to provide power for industrial equipment is based on very solid values.

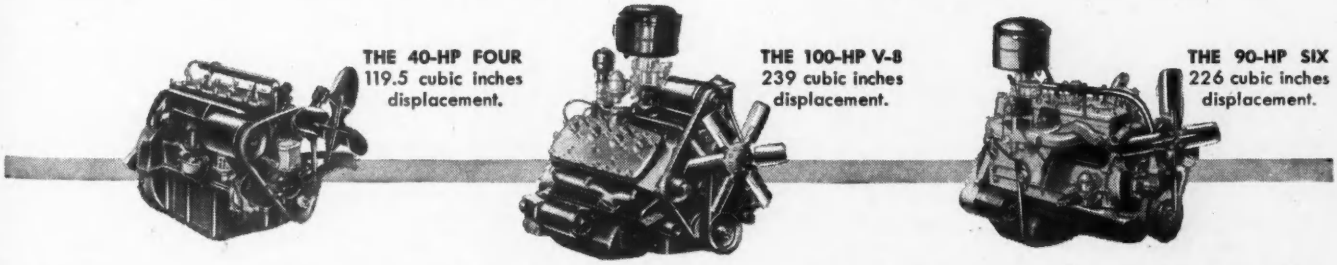
Many millions of car and truck owners know, by long personal experience, how excellently Ford engines are engineered, how well they are built, how enduring and reliable and economical they are.

They know, too, that when a man buys Ford-engine-powered machinery, he's assured of authorized Ford Service on the engine almost anywhere he goes. The equipment manufacturer and his distributors, too, are relieved of all concern and expense of maintaining engine parts stocks and service facilities. That responsibility is gladly and competently shouldered by Ford Dealers and Parts Distributors.

What finer reasons could there be for the choice of any engine?

Ford Motor Company has made available to manufacturers and individuals the three popular engines shown below. You can purchase them, singly or in quantity, through any Ford Dealer or from Ford Motor Company. For detailed specifications and dimensional data, write—

FORD MOTOR COMPANY
Industrial and Marine Engine Department, No. 100
DEARBORN, MICHIGAN



THE 40-HP FOUR
119.5 cubic inches displacement.

THE 100-HP V-8
239 cubic inches displacement.

THE 90-HP SIX
226 cubic inches displacement.

FOR INDUSTRIAL AND MARINE POWER

Copper and Its Alloys

(*Continued from page* 31)

Nearly 54 lb of copper, brass and bronze are in a Mercury. The radiator has 18 lb of copper in its fins and 12 lb of copper and brass in the tubes, headers and tanks. Other uses of these metals are: generator 4.2 lb; starter 3.7 lb; wiring 3.8 lb; copper in the cast iron and steel three lb; one lb in aluminum alloy pistons and about eight lb of miscellaneous brass and bronze parts.

The Lincoln contains almost 65 lb of copper and its alloys. In the radiator there are 18 lb in the fins and 12 lb of both copper and brass for tubes, headers and tanks. The generator has 4.2 lb; starter 3.7 lb; wiring 3.8 lb; four lb in aluminum alloy pistons; six lb of copper in bronze parts; five lb in cast iron and steel and about eight lb in brass and bronze parts.

The new Chrysler Six four-door sedan has 19.75 lb of copper for electrical purposes, excluding plating. The radiator, also excluding plating, contains 21.4 lb; heater 5.8 lb; plating 1.3 lb; other copper alloys, exclusive of plating, 3.55 lb, and all other copper content 0.1 lb.

The breakdown of copper and its alloys in the Chrysler Eight model is given as follows: Electrical purposes, excluding plating, 19.75 lb; radiator, excluding plating, 42.25 lb; heater, excluding plating, 5.8 lb; plating, 1.3 lb; other copper alloys, excluding plating, 4.1 lb; and other copper content, 0.6 lb.

The engineering department of Chrysler lists the following parts of the 1946 Chrysler Eight containing copper and its alloys: Generator, starting motor, ignition coil, ignition distributor, wiring harness, electrical windshield wiper, voltage and current regulator and cutout relay, automatic choke, horns, electric switches, heater motor, radio. The following instruments contain copper and brass in various forms: Water temperature gage, oil pressure gage, ammeter and fuel gage. The bearings or bushings used to carry the following parts contain amounts of copper and its alloys:

Crankshaft, connecting rods, camshaft, steering knuckle pivots, transmission drive pinion pilot, water pump shaft, generator shaft, starting motor shaft, steering gear shaft, fluid coupling runner, distributor shaft and clutch and brake pedal shaft. Radiator and interior body decorative medallions contain a high percentage of copper and its alloys. Cylinder head gaskets are made of copper sheet and asbestos. The cooling system thermostat is of the bellows type made of brass. Carburetors are die castings containing copper. Springs and jets within the carburetor also contain this metal. Hydraulic brake line fittings, oil filter line fittings and fuel line fittings are made of brass.

A survey breakdown of the Hudson car reveals that 13.9 lb of copper are used in the electrical system; 15.8 lb in the radiator; 2.5 lb in the heater; 1.5 lb in the plating; and another 16.8 lb of copper and its alloys used in many other parts of the car.

In the 1946 Packard Clippers there are about 13.5 lb of copper and copper alloys in the engine for bushings, etc.; 26 lb in the radiator and 1.07 lb in the ignition system and wiring. The total copper content consists of 12 lb in the body, one pound in materials which the company processes, and 46 lb in materials purchased.

Packard Canadian Headquarters

The rapidly-growing automobile market in Canada has prompted the Packard Motor Car Co. of Canada, Ltd., to plan immediate construction of a two-unit headquarters at Windsor, Ont. Ground has been broken, and the project is scheduled for completion by Jan. 1, 1947. Besides the office-and showroom building there will be a large warehouse from which new cars, parts and accessories will be distributed throughout the Dominion.

Why GM Production Is Only Half of '41 Rate

(*Continued from page* 17)

during this year. I don't know just why. So that is one material that is tied up by price and basic capacity.

The demand for cars is larger now than it was when the Japanese War was over. The total industry hasn't produced enough cars this year to make up for the scrapping of all old cars. So the situation now is the worst it has been yet. The potential market depends on the price level, whether the people of the country are willing to go back to work for the things they like to have. It depends on what kind of dollars we have, how difficult they are to get. We thought we were going to sell a lot of Chevrolets at $1000, but if we have another bunch of inflation and have to sell them for $2000, I don't think we will sell so many. I am a little doubtful about estimating, but if the people of our country would really go to work, we can sell as an industry six million cars a year for several years.

The kind of sheet steel that we use in making motor cars that is the most critical steel item. The sheet makers are promising about 75 per cent of what we would like to have. Priorities for housing are affecting the amount of sheet steel we can get to some extent.

Government Controls

A return to a competitive economy, due to the elimination of all price controls, would ultimately reduce prices and stimulate production, but here is the greatest difficulty: this country has put restrictions of various kinds—prices, production and use of materials, allotments and so forth, but nobody yet has developed any equitable way of distributing a shortage. The politicians completely dodge that one. They have said, "Well, we have to charge a certain price for our cars if we can only have so much copper and so much lead and so forth."

But we had to pay certain wages. They have told us that but have completely dodged how you distribute a reduced number of motor cars, and how you do that equitably.

If the present controls remain in effect on lead and steel and that sort of thing we will keep operating, but at what level will depend on the things that are controlled. I don't think anyone would forecast a year ago that we would have the disastrous strikes that we had. If you take one industry after another, glass, steel, and nonferrous metals, and the electrical industry, and shut them down one after another, the automobile industry is hit the worst because we use something of almost everything that anybody makes in some form or another. We use so many different kinds of material. There was hardly a strike anywhere in the country, except in retail distribution, that did not have some effect on our production.

Up to the present, the number of completed motor cars has not been affected by basic raw materials; it has been affected more by parts; that is, crankshafts or springs or a thousand items that the supplier has been unable to supply because of a strike in his plant.

Raw Materials

Right now, unless we have another wave of strikes, with the improvement that is going on now, the more basic raw materials will likely bother us this fall. I think certainly something can be done about copper and lead. The copper, if I have my information correct, can be handled for four or five

(*Turn to page* 68, *please*)

months by the Government supply in the metal reserve. They have accemulated a stockpile of copper, and if they dish that out in the right places to keep production going they can handle the copper supply for a while.

The position is not nearly as favorable on lead. We could import lead, but it is under Government control and they won't give you any no matter how much you are willing to pay. In a way it is a logical position for them to take because it isn't very consistent to let you pay foreign people nine cents and only pay eight cents to citizens of your own country. So they shut that off and say you can't deal outside of your country. We are still working on and have made application for permission to buy lead outside of the United States. We have to find the source before we can get the application recognized, and we do not have a source for foreign lead, but we can go ahead and try to find something anyhow.

If we don't have any more strikes in suppliers plants and in view of what I think is the probable available steel, we should be able to increase our production about 20 per cent over the previous month in September and October, and then November and December will flatten off at about that point. To operate soundly in a manufacturing business like the motor car business, you ought to break even at somewhere between one-third and one-half of capacity, because you cannot operate at capacity 12 months of the year year after year. Now, the difficulty with our present operations, as near as I can see, are the deficiencies caused by this disorganization of reconversion, the Government controls and the shortages; the training of the working force for car production again, and the fact that the OPA expected too much of us, particularly of General Motors. They had certain formulas and ways of looking at things, but I don't know of any good reason why a Chevrolet should sell for $100 less than a Ford or Plymouth if it was $5 more prewar or something like that. In other words, we got a little extra squeeze.

General Motors had a total of what you might call an excess tax reserve of about $160,000,000. And to make all of that available, we would have to lose $190,000,000 in our manufacturing and selling operations. Then we get $160,000,000 of that back and we have an operating loss on the balance sheet of $30,000,000. As far as I am concerned, it had nothing to do with the way we planned any of our operations.

Labor Supply

The labor supply in most industrial areas is surprisingly short. The forecast put out by certain Government agencies that we would have eight million unemployed last fall and this spring and so forth, was certainly not realistic. In part it is responsible for the mess we are in, because it justified the unions if they believe it, in making a demand for an immediate 40 hour week and the take-home pay.

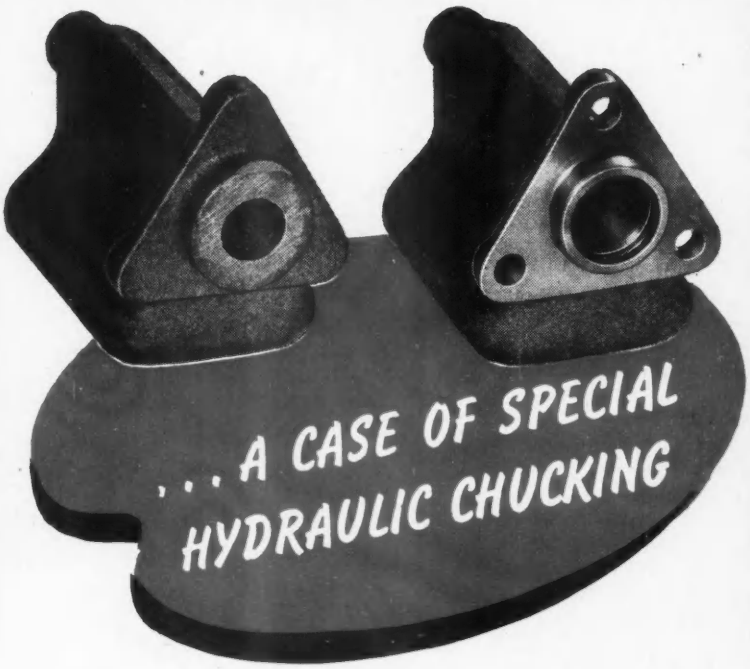
What the country should have done was to have kept working on approximately the wartime basis until we got through this duration, until we got the shortages made up. If that had been done, we could have kept the prices, we could have had the production, and we would be very, very much better off. The value of our money would have not been written down. I remember that last fall I suggested that, and had an awful blast as a result of it. If we had another round of wage increases prices would go up again.

I have authorized 13 reductions in schedules and every time we make up a forecast on where we think we will be, we cut it again. The last time, we said we were definitely going to make that many cars, and whether we finish up by Thanksgiving or Christmas, that is where it is. As a result, I don't have any good forecasts for operations.

I think we made a little profit in August, but I don't have the figures yet. We made a small profit in the previous month, something like one per cent of sales. In September, 1940, when we put the prices on the 1941 cars, the average straight-time hourly rate at General Motors was a little less

(*Turn to page 70, please*)

LEADERSHIP BASED ON ACCOMPLISHED FACTS

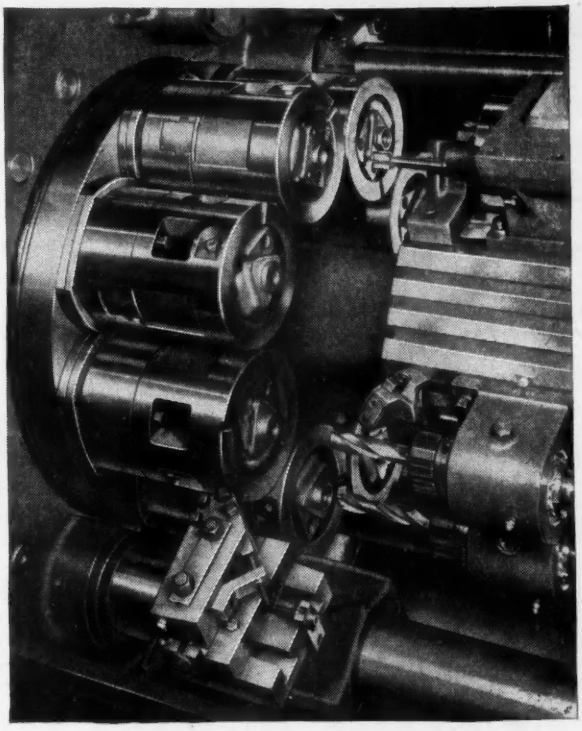


The master cylinder and supply tank illustrated above is manufactured by the Wagner Electric Corporation of St. Louis on a Model 88 New Britain eight spindle automatic work rotating chucking machine. The most difficult problem encountered in tooling this job was to synchronize the multiple drill head with the irregular shaped flange for accurate drilling of three mounting screw holes.

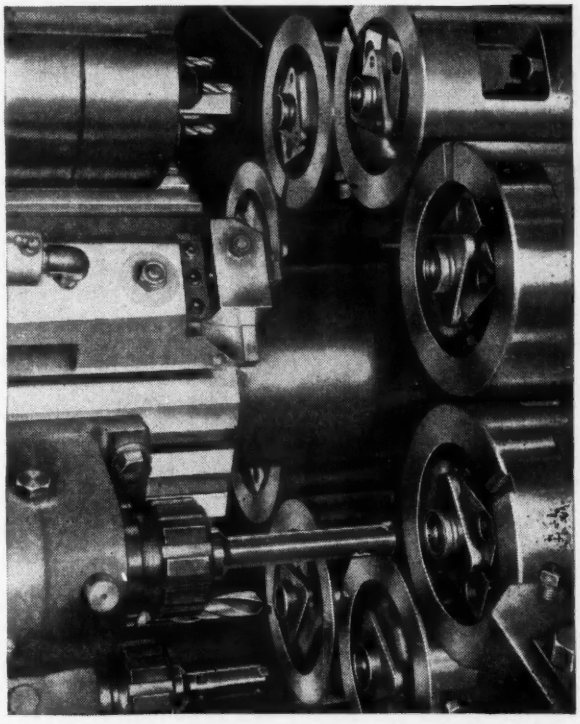
Our engineers developed a special hydraulically operated chucking fixture which positions the piece exactly the same at each chucking—permitting, with an ingenious locating device, proper synchronization of the drill head and the work. Otherwise the flange holes would have required a separate rehandling and a drill press operation with a resultant increase in the cost per piece.

Let our engineers help you to save extra operations in the machining of your work. Be sure to check with our field representatives or our home office about that new product you are designing or about better methods to machine your present products.

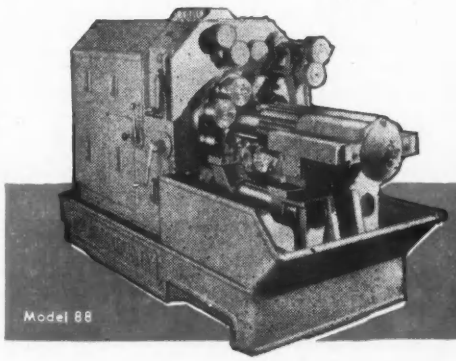
★



Entirely open end construction... Loading position easily accessible



REAR VIEW: Note accessibility of all tools



NEW BRITAIN AUTOMATICS

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT
NEW BRITAIN-GRIDLEY MACHINE DIVISION

than 90 cents an hour. In July of this year it was $1.2839. That is 42 or 43 per cent higher.

Car Prices

The Chevrolet price was $748 in the fall of 1940, which was for the 1941 model. The estimated corresponding Ford price was $753; the corresponding Plymouth price was $774 and the Nash was $765. That was a lighter Nash car—their new low-priced automobile.

Now, the present prices on those cars are $1005 for a Chevrolet, $1093 for the Ford, $1142 for the Plymouth and $1206 for the Nash. The percent increases over '41 are 34.4 per cent for this particular model of Chevrolet; 45.2 per cent for the Ford; 47.5 per cent for the Plymouth, and 57.6 per cent for the Nash. General Motors wages have gone up in the period 43 per cent. Our prices are not satisfactory on the present volume or possible volume of business at the present wage level. We should have some additional price relief. If you want a nice round figure, about $100 an automobile.

Government Predictions

If we had not had the strikes and could have taken the position we were in during the war, including the earning capacity, and gone to work, we would be in good shape. If you want me to be real frank, I think it is the administration's fault. They are the ones who encouraged the present big international unions. They made about three very bad forecasts. I mentioned one a while ago, about the big unemployment that the country faces. No experienced industralist or business man would forecast anything like that at all, because with the whole country crying for goods, why should there be unemployment unless it was organized unemployment?

The other one was that industry was in a position to make every substantial wage increases without increasing the prices. That was not so, and everyone knew it who had anything to do with business. And with three changes in the wage price policy of the country between August, 1945, and March 1, 1946, you have the answer, and it shows up the situation we are in now.

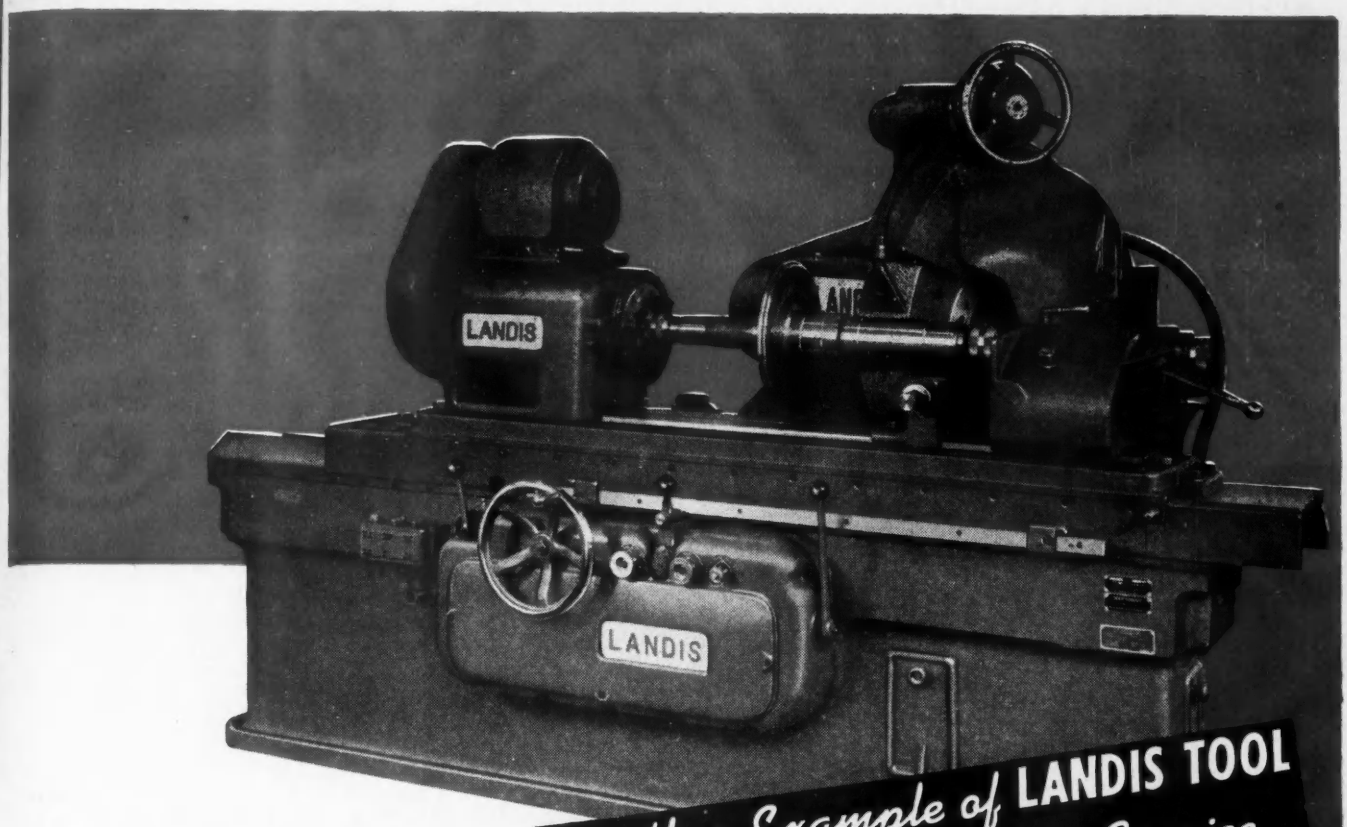
The first change in wage price policy was a statement made shortly after the Japanese War was over, that wage controls were relieved and anyone could adjust wages if he would not use it as a reason for asking for a price increase or resisting the price reduction that otherwise should be paid.

The second one was that wherever wages had not gone up as much as the assumed cost of living, and they didn't quite tell you what that was, you could make that kind of wage and salary adjustments and count them a proper reason for increasing prices.

The next settlement was the cold inflation of wages and prices.

Something might have been done on

(*Turn to page 74, please*)



Another Example of LANDIS TOOL *Engineered Grinding Service*

14″ x 36″ CH PLAIN GRINDER with 30° angle wheel base, right hand wheel mounting. Plus hydraulic rapid infeed, table type diamond holder for face dressing, table type side truing bar, ball bearing live work centers.

● Here is another production grinding problem where Landis Tool engineers combined two grinding operations by modifying a standard machine. As a result, grinding time was cut more than 50% and airplane propeller shaft production was increased. The solution to this kind of problem is typical of the help that you can get from Landis Tool to solve your grinding problems. Each problem is analyzed by engineers experienced in grinding production.

Our recommendation for your problem may involve modifying a standard machine or the building of special fixtures to get your production or tolerances. Call on us for Landis Tool engineered grinding service.

38

CENTERLESS GRINDERS TOO, BY LANDIS TOOL...OF OUTSTANDING NEW DESIGN. WRITE FOR CATALOG T44

LANDIS TOOL *Company*

WAYNESBORO, PENNA.

the wage price policy if the administration, frankly, tried to handle the problem, but it wanted to put business people in the middle. It wanted the vote-getting position of no increase in prices. It wanted the vote-getting position with the big unions of wage increases; so it just put the industry in the cracker. I think that the country ought to have a wage price policy and stick to it. Actually, the only excuse for trying to control prices is to control wages and avoid inflation, and the failure to recognize that wages were the basic thing and their control was necessary. Politically, that is too hard to handle, frankly. The original price control should have had a wage control tied right in with it. When one goes out the other one should go out.

The stage is getting set for a wave of strikes. These industry-wide strikes create shortages and shortages create price increases. Price increases reduce the purchasing power of the people. If we have another wave of price increases and wage increases, we will certainly reduce the potential market. Whether another adjustment of 10 per cent or so would knock out the possibility of a six million car year, I would not attempt to say. I don't think it would, but it would reduce the market of many people who otherwise could afford to have cars and would not finally turn up with them. Continuing strikes and Government control of basic commodities are the greatest threats to production.

Peak Production

By this time next year, or by January of 1948, or for the first quarter of 1948, the industry ought to be about at peak production. If we can't get the country settled down by that time, it is going to be too bad. If somebody tries to establish a 30-hour week that is something different. A 30-hour week, in my judgment, would make a second-class nation out of our country in about five years. We are working about 39 hours a week now. It would be 40 if the people didn't stay away too much. So the slip under 40 is due to the people themselves. But we have plants where as many as 20 per cent of the people are absent. That used to be about 2½ per cent.

In September, 1940, we had 235,395 people working in General Motors as an average for the month, 44,520 of those were on salary rolls, and 190,575 were paid by the hour. In September, 1941, we had 274,857 people, about 40,000 more, 52,535 on a salary and 222,322 hourly workers. During that period we had 265,000 people employed, and we produced about 55,000 cars and trucks a week. In July of 1946 we had 323,496 people, 70,148 of them salaried and 253,348 hourly rated and we are producing only half as many cars as we did in '41. That doesn't look like my 80 per cent figure on efficiency is correct. But we are still doing quite a lot of reconversion and so-called non-production and construction work, and tooling, and also we have an excess number of people trying to find out why we can't build some more cars, and chasing material all over the world. So, we have the people on the payroll all right, but due to the Government regulations, the amount of paper work you have to do, and difficulty of getting the flow of material reestablished, we aren't making the products.

Annual Wage

The annual wage is feasible only in a stabilized economy, and if you have a stabilized economy, you don't need it. That is about the type of problem it is. If the annual wage meant paying people for not working, they have just created another difficulty in business.

These one-way things are always a doubtful factor in the total economy of the country, and one of the difficulties we have now is that the people don't stay with us. So, the first thing you know, if you get an annual wage on the one side and a guarantee from the employe he is going to stay with the company on the other, you have the whole economy frozen. We are making quite a study of the problem and we are trying to stabilize our business, and give our people regular work to the maximum degree that we can.

Trailer Operation

(*Continued from page* 36)

the Budd-built roof panel assembly is installed in place and properly fitted to the front nose and side panels. The roof is then securely clamped in place and ready for final welding. The welding operation joins the roof to Z-posts on the inside, the roof flange to the front nose and side panel flanges on the outside and to the corner posts as well. This station also includes some riveting work, principally for securing the apron plate to the body.

As illustrated, the third fixture has a rail around the top section for guiding and supporting the welding guns. Similarly, the two guns for inside welding are mounted on a separate rail which slides into the body after the latter has been clamped in the fixture.

After leaving the fixture the vehicle moves on the floor assembly line from station to station until all detail operations have been completed. At the present time the length of the building restricts the straight length of the final line, making it necessary to bend it around in the form of a U. Among the detail operations necessary to complete the assembly are the following:

Drilling of holes for clearance lights.
Installation of top clearance lights.
Installation of tail lights, reflectors, etc.
Installation of wiring.
Lines and hose connection for brakes.
Fitting and installation of flooring.
Drilling of holes for door mounting.
Installation of lining.

The plant has a large bay devoted to the painting of mechanical parts such as brake and axle assemblies, gear boxes, front frame and vertical support, etc. These parts are hung on a heavy-duty monorail conveyor which transports the work through spray booths, then through baking ovens. After drying the parts go into the assembly department for installation on the frame subassembly line.

Although this study is concerned with the manufacture of stainless steel trailers, it is of interest to note that Fort Wayne is the scene of what is said to be one of the largest commercial tank body production operations in this country. This line is being expanded at the present time.

Knock-Down Bodies

(*Continued from page* 44)

bodies mainly in the use of the rounded nose section and in the provision of a sub-frame for mounting the suspension, landing gear, and fifth wheel. The subframe is shipped loosely to enable the body builder to install it in the proper width to suit the suspension system selected by the customer.

Must We Have Strikes?

(*Continued from page* 15)

Our business and economic life cannot develop normally and function properly if it must carry on continucusly in the climate of ever-threatening stoppages and actual shut-downs. There can be no reconversion, no stability, no prosperity, if the leaders of industry are not able to plan with some degree of assurance that production will not be interferred with.

Whether the leaders of organized labor or its members like it or not, they must develop a concern for all the layalties that reach out and affect the lives of all of the people and the well-being of our government. Without our form of government, which seeks to promote life, liberty and the pursuit of happiness for all our people, labor unions and labor leaders could not exist at all. To be patriotic today is not sentimentality; it is stark necessity.

To those who would say, "What substitute would you offer for the strike?" the answer must be that either labor and management approach their common problems in an atmosphere of absolute freedom and absence of pressure interference on the part of politically minded government agencies and seek to work out their mutual problems, or else there must emerge some non-political tribunal of judicial character to which both parties will have to go and present their respective cases for ultimate decision.

Interestingly enough, it has been suggested that once the leaders of organized labor can no longer look to government agents for biased decisions favorable to them, these same labor leaders, as well as the rank and file, will be far more willing to cooperate with management in working out amicable results involving any legitimate grievance. Should this latter materalize, and there is good reason for believing it will, it will make largely unnecessary the resort by either party to such a suggested tribunal.

Certainly the strike is an outmoded and a most dangerous weapon. It is like a fire out of control, threatening to devour and destroy everything before it. Organized society and the welfare of all of our people are more important than the exercise of a technique by irresponsible labor leaders. There is no reason why the public and the nation should be jeopardized because of the struggle for position in the unions or the sinister influences of subversive groups who use the organized labor movement as agencies for their contentions and usually without any regard for the well-being of either the members of the unions or the nation at large.

It is the opinion of the writer that given assurances that there will be no political interference—in other words, that government will be impartial and fair instead of being biased and prejudiced—management will go a long way in meeting organized labor in a frank and honest effort to adjust grievances. This cannot be said for Communist-controlled unions nor for those unions where the racketeer holds the reins of power.

To bring the unions down to earth within reach of their membership and amenable to their membership, is another story. What is all important now is to understand that the use of the strike today is definitely anti-social and so completely destructive as to be intolerable. This may not suit the fancy of our present-day labor padrones, but it is the fact. In the face of this reality, the rights of all the people and the safety of the nation must predominate.—*Extracted from an original article published in The Detroiter.*

The Warner Electric Brake is a simple mechanical brake, operated by an electro-magnet and armature disc. Each wheel is a complete brake unit. The braking power is generated within the brake itself. A wire to the battery and a controller complete the system — famous for its simplicity.

WARNER
ELECTRIC BRAKES

Ford Tooling

(*Continued from page* 23)

into the centers; while the one on the right is used for lifting the crankshaft out of the work station and transferring it to the outside. This relieves the operator of the usually arduous task of lifting cranks from a conveyor into the machine and out of the machine.

The LeBlond lathes have played a major role in the development of the revised crankshaft department. One machine now combines in one setting a group of six initial operations formerly done on hand lathes. Moreover, the output of one machine is greater than that of the five manual machines used in recent years. One effect of their adoption is that a single battery of LeBlond lathes has replaced the equipment formerly housed in a large area of the shop, thus releasing much valuable floor space for other activity.

In addition, the new machining method increases productivity, simplifies materials handling, and is responsible for a higher level of quality and a reduction in scrap.

Generally speaking, the changeover retained most of the machinery formerly used in this department. Among the more recent items of equipment found here are the large Landis four- and five-wheel crankshaft grinders. These machines grind the crank main line bearing points in one setting, thus complementing the single-setting turning of the main line on the new LeBlond lathes.

C. W. Seiberling

C. W. Seiberling, 85, first vice-president of the Seiberling Rubber Co., died Sept. 20 in the Akron City Hospital, Akron, Ohio. With his brother, F. A. Seiberling, he founded the Goodyear Tire & Rubber Co., in 1898. They lost control of Goodyear in 1920, and later established the rubber company bearing their name at Barberton.

PICAO Airworthiness Standards

(*Continued from page* 27)

ring under the following conditions. when the wing flaps are extended as prescribed in the preceding paragraph. (a) those corresponding with a equal to 2.0. These conditions are represented by point I, on Fig. 1. Zero pitching acceleration may be assumed; (b) those corresponding with up and down gusts of 25 fps, *EAS* perpendicupositive maneuvering load factor n lar to the flight path, the gust-gradient being that prescribed in Gust Envelope. These conditions are represented by points I′, J′ on Fig. 2. Horizontal tail loads and airplane equilibrium shall be obtained as prescribed in Horizontal Tail Surface Gust Loads; (c) those corresponding with a rearward gust of 25 fps *EAS*, along the flight path, with no alleviating factor.

SLIPSTREAM EFFECTS — The wing flaps, their supporting structure and operating mechanism, shall have sufficient strength to withstand the loads resulting from the effects of slipstream, for all symmetrical power conditions from zero thrust to thrust at maximum take-off power, under the

Wing-flap position	Landing and approach	Take-off
Flight speed	1.4 V_{s_1}	1.4 V_{s_1}*
Airplane weight	Design landing weight	Design take-off weight

V_{s_1} is the stalling speed, wing flaps retracted at the appropriate airplane weight.

*When the applicant (manufacturer) has elected to declare a higher speed for use with flaps in the take-off setting (Design Flap Speeds and Positions), this higher speed shall apply instead of 1.4 V_{s_1}

ASYMMETRICAL WING-FLAP LOADS—The structure of the airplane shall have sufficient strength to withstand the loads imposed when the wing flaps on one side are carrying the most severe loads occurring in the prescribed symmetrical conditions, and those on the other side are carrying not more than 80 per cent of that load. Suitable provision shall also be made for the asymmetrical loading which occurs when the engines on one side of the plane of symmetry are inoperative, and the remaining engines are operating at maximum take-off power.

Asymmetrical Maneuvering and Gust Conditions

The airplane shall be assumed to be subjected to rolling and yawing maneuvers as described in the following conditions:

ROLLING MANEUVERS—The airplane shall have sufficient strength to withstand the loads resulting from the maximum aileron deflections likely to occur in operation.

ASYMMETRICAL VERTICAL GUST LOADS — The airplane structure shall have sufficient strength to withstand asymmetrical loads resulting from vertical gusts. In the absence of information substantiating some more accurate assumption, the loads resulting from the symmetrical flight condition at point A on Fig. 1 shall be modified by assuming that 100 per cent of the wing airload acts on one side of the plane of symmetry, and 80 per cent on the other side.

YAWING MANEUVERS—The airplane structure shall have sufficient strength to withstand the loads resulting from the maximum rudder deflections and sideslip angles likely to occur in normal conditions of operation, including the case of sudden failure of the critical outboard engine.

LATERAL GUSTS — The airplane shall be assumed to encounter a 50 fps gust perpendicular to the plane of symmetry while in steady flight at the design cruising speed, V_c. Note: The alleviating effects of gust-gradient and lateral motion of the vertical surfaces may be taken into account by applying a suitable alleviating factor to convert the specified gust into an equivalent

(*Turn to page* 86, *please*)

sharp-edged gust. If yawing motion is taken into account, the alleviating factor should be based on the yawing stability of the airplane as a whole.

Supplementary Loading Condition

EFFECTS OF ENGINE OPERATION—The engine mounting, and the structure in the vicinity of the engine, shall have sufficient strength to withstand the loads corresponding with the specified flight and ground loads, in combination with appropriate engine torque, thrust and gyroscopic moments. Fluctuation of torque, particularly in the case of engines with a small number of cylinders, shall be considered.

PRESSURE-CABIN LOADS — The airplane structure shall have sufficient strength to withstand the flight loads combined with pressure-differential loads from zero up to the maximum relief-valve setting. Account shall be taken of the external pressure distribution in flight. If landings are to be permitted with the cabin pressurized, landing loads shall be combined with pressure-differential loads from zero up to the maximum to be permitted during landing. The airplane structure shall have sufficient strength to withstand the pressure-differential load corresponding with the maximum relief-valve setting, with a suitable margin to provide for such effects as fatigue and stress concentration. A pressure load corresponding to 1.33 times the maximum relief-valve setting is considered to provide a satisfactory margin. All other loads may be omitted in this case.

When a pressurized cabin is separated into two or more compartments by bulkheads or floors, the primary structure shall be designed for the effects of sudden release of pressure in any compartment having external doors or windows. This condition shall be investigated for the effects resulting from the failure of the largest opening in a compartment. When intercompartment venting is provided, the effects of such venting may be taken into account.

CONTROL-SURFACE LOADS — The control surfaces shall have sufficient strength to withstand the loads resulting from the symmetrical and asymmetrical flight conditions prescribed under Flight Loads, and its subparagraphs, and shall also comply with the following requirements:

HORIZONTAL TAIL SURFACES—Horizontal tail surfaces shall be designed for asymmetrical loads arising from yawing and slipstream effects in the symmetrical and asymmetrical flight conditions. Except for unconventional arrangements, such as exceptionally high slipstream torque and large wing or tail dihedral, an acceptable arbitrary criterion for asymmetrical horizontal tail surface loads is as follows: the maximum loading from the symmetrical flight conditions should be modified by assuming that 100 per cent of that loading acts on one side of the plane of symmetry, and 75 per cent acts on the other side. When outboard fins are attached to the horizontal tail surfaces, the tail surfaces shall be designed for the maximum horizontal surface loading in combination with the corresponding loads induced on the vertical surfaces by end-plate effects.

VERTICAL TAIL SURFACES—When outboard fins are attached to the horizontal tail surfaces, proper account shall be taken of the loads on the vertical tail surfaces due to yawing maneuvers and gusts, in combination with the loads induced by end-plate effects.

TABS—At all speeds up to V_D, elevator trim tabs shall be designed for the deflections required to trim the airplane at any point within the positive portion of the *V-n* diagram (Fig. 1), except as limited by the stops. Aileron and rudder trim tabs shall be designed for the deflections required to trim the airplane in appropriate asymmetrical weight distributions and rigging, and symmetrical and asymmetrical power conditions. Balancing and servo tabs shall be designed for deflections consistent with the primary-control-surface loading conditions.

Control System Loads

PRIMARY FLIGHT CONTROLS

(*Turn to page* 88, *please*)

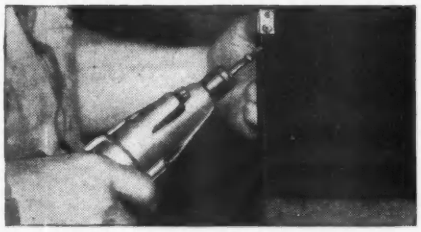
YORK credits Phillips Screws

"Faster driving cuts assembly time and costs in shift to mass production"

— **REPORTS INVESTIGATOR** from James O. Peck Co., industrial research authorities who are studying assembly methods in leading plants. At York Corp. he got information valuable to mass producers. Highlights follow:

"Phillips Screws were a big help in working out methods of large scale production of the Yorkaire Room Conditioner," the plant superintendent of the York Corp. told the James O. Peck Co. investigator. "To get production we knew we'd have to use self-tapping screws and power drivers on our sheet metal assemblies, but that got us into a lot of trouble with slotted screws.

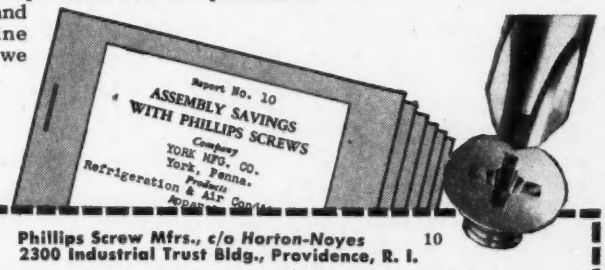
"The Phillips Recessed Head Was a Natural for Power Drivers and Self-tapping Screws. No trouble locating screws or keeping bits in the screw head. No damaged panels or other handicaps that slow down production. Since we adopted the Phillips Head in '37 it's been standard on all sheet metal assemblies.



"One-Hand Driving Is Easy With the Phillips 'Engineered Fit'. The precision recess snugs right onto the bit of the power driver and sticks there, making it so easy for the operator to center the screw in the hole that he can hold the work with one hand and drive with the other.

"Eliminated the Tremendous Amount of Screw Driver Slippage. Panels were no longer chewed up, a stop was put to turned or burred screw heads and the whole assembly line speeded up the moment we changed from slotted to Phillips Screws."

Important Information for You is available in the unabridged report by this independent investigator of the York Corporation's experience with Phillips Screws. *Other reports,* covering assembly practises in 9 prominent plants making products of metal, wood and plastics, are yours for the asking... FREE! Use the coupon NOW.



PHILLIPS *Recessed Head* SCREWS

Wood Screws • Machine Screws • Self-tapping Screws • Stove Bolts

26 SOURCES

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.....

AND SYSTEMS — The flight-control system and supporting structure shall have sufficient strength to withstand loads corresponding to maximum pilot effort with proper consideration of loads produced by automatic pilots or power-assisted control systems; alternatively, if a reliable estimate can be made of hinge moments of the control surfaces, assuming power-assisted control systems, if any, to be inoperative, the control system may be designed for loads corresponding with 1.25 times the maximum control-surface hinge moments; provided that the control system shall have sufficient strength to withstand loads not less than those specified for minimum pilot effort.

Pilot Effort Limits

Control	Maximum pilot effort	Minimum pilot effort
Aileron		
Stick lateral	80 lb	40 lb
Wheel lateral	80 lb	40 lb
Wheel up and down	100 lb	50 lb
Wheel torque	80 D* lb in.	40 D* lb in.
Elevator		
Stick	200 lb	100 lb
Wheel	250 lb	100 lb
Rudder	300 lb	130 lb

*D equals the diameter of the control wheel.

The loads shall in any case be sufficient to ensure a rugged system to provide for jarring, taxying tail to wind, control inertia, friction, and gusts encountered by the airplane while on the ground. The loads due to pilot effort shall be assumed to act at the appropriate control grips or pads in a manner simulating operating conditions and to be placed in equilibrium by an appropriate force at the attachment of the control system to the control-surface horn. When a power-assisted control system is installed, adequate strength shall be provided to withstand the manually-applied loads which are likely to occur in the event of failure of the power source of the system.

DUAL CONTROLS — When dual controls are provided, the system shall have sufficient strength to withstand the loads applied by the pilots acting in opposition to each other. For this case, individual pilot effort equal to 75 per cent of those prescribed in the preceding paragraph shall be assumed; except that the individual pilot effort shall be not less than those specified for minimum pilot effort. Consideration shall also be given to the case of pilots acting together, particularly where a power-assisted control system is installed, the failure of which would necessitate the use of high manual-control forces.

AILERON WHEEL LOADS—In all the aileron-wheel loading cases, the loads shall be applied tangentially to the rim of the wheel. In the aileron-wheel torque case, the torque shall be produced by equal and opposite forces, applied tangentially at opposite sides of the wheel.

(Part III, the concluding installment, will appear in the October 15 issue)

Faying Surfaces

(*Continued from page* 37)

Organic Coating: (1) One coat of zinc chromate primer on each surface. (2) One coat of zinc chromate primer on the aluminum and two coats on the steel. (3) Two coats of zinc chromate primer on each surface. (4) Two coats of zinc chromate primer on the aluminum and three coats on the steel. Zinc chromate paste was applied to the latter so that when the two surfaces were brought together a small bead of paste was formed around the aluminum.

AMC52S-H MAGNESIUM WITH 24S-T ALCLAD—The ratio of surface areas was in the proportion of four parts of magnesium to one of aluminum alloy.

Chemical Treatment: The magnesium was dichromate treated according to specification AN-M-12. The Alclad was anodized.

Organic Coating: (1) Two coats of zinc chromate primer on each surface. (2) Three coats of zinc chromate primer on each surface. Assembled with zinc chromate paste.

AMC52S-H MAGNESIUM WITH 24S-T DURAL—The ratio of surfaces was four parts of magnesium to one of aluminum alloy.

(*Turn to page* 90, *please*)

Just a TAP of the finger!

•That's all it takes to obtain any one of 12 spindle speeds on a Gisholt Turret Lathe . . . instantly . . . without releasing the main drive clutch . . . without even stopping the spindle. With the Gisholt Hydraulic Speed Selector you eliminate all manual gear shifting—put an end to needless effort and waste time between cuts.

It is particularly effective where parts require turning a number of diameters. You set up the job, determine the ideal machining speed for each cut, and pre-set the speed selector with reference to the diameter of the work. Then you have merely to touch the trip for each successive speed change. There's no effort to it. The speed selector is power-operated.

Or, you can use the speed selector "direct"—by simply turning the control wheel to obtain any desired spindle speed without intermediate stops.

However you use it, it saves time, speeds up production, cuts machining costs. Write for literature.

GISHOLT MACHINE COMPANY

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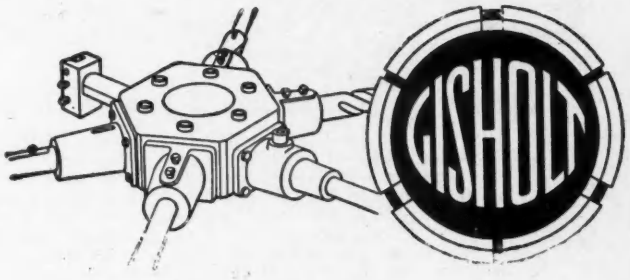

Look Ahead . . . Keep Ahead . . . with Gisholt

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

Chemical Treatment: The magnesium was dichromate treated according to specification AN-M-12. The Dural was anodized.

Organic Coating: (1) Two coats of zinc chromate primer on each surface. (2) Three coats of zinc chromate primer on each surface with zinc chromate being applied on assembly.

AMC52S-H MAGNESIUM WITH 18-8 STAINLESS STEEL—The ratio of surfaces was in the proportion of four parts of steel to one of magnesium.

Chemical Treatment: The magnesium was dichromate treated according to specification AN-M-12. The stainless steel was rinsed in a two per cent solution of nitric acid for two min. (used currently in Ryan shop for the removal of ferric iron contamination accumulated during forming and sand blast).

Organic Coating: (1) Two coats of zinc chromate primer on each surface. (2) Three coats of zinc chromate primer on each surface. Assembled with paste.

All of the specimens in the aluminum to cadmium-plated steel group were kept in the salt spray cabinet for 1007 hr without any evidences of corrosion occurring. Fig. 1 shows one of these test specimens with the organic coatings intact at A, and after the coatings were removed at B.

The magnesium to aluminum combinations showed signs of corrosion after 72 hr of exposure in the salt spray cabinet. They were allowed to remain for 255 hr and then removed for inspection. Fig. 2 shows the result of galvanic corrosion sustained by one of these specimens. It is interesting to note that the insulating washers next to the magnesium were of no protective value. Both the washers and the areas with which they were in contact were excessively corroded.

From these tests it seems that certain useful conclusions are justified. For adequate protection against corrosion due to dissimilar metal galvanic attack in areas exposed to the most extreme weathering conditions, one coat of zinc chromate primer on each of the faying surfaces of 24S-T aluminum in contact with cadmium-plated low carbon steel is sufficient. The 1007 hr salt spray test shows that this treatment produces a corrosion resistance equal to that acquired by the use of a heavier paint system.

In the case of magnesium alloy in contact with 18-8 stainless steel, 24S-8 aluminum or 24S-T Alclad, three coats of zinc chromate primer on each faying surface, assembled with zinc chromate paste is superior to a two-coat paste system. Salt spray tests show that this finish schedule, required by specification SR-101, is the optimum for adequate protection although the recently issued SR-15e deletes one of these coats per surface. Where severe attack may be expected, no reduction in the number of coats in the interest of saving weight should be made.